COAL AGE

Vol. 1 NEW YORK, JUNE 22, 1912 No. 37

HAVE you ever noticed that your view of a subject is distorted by the way in which you regard the man who discusses it? And as Kipling writes, "It ain't hexactly what 'e says, it's the nasty way 'e says it." But to arrive anywhere, we must scrape away the husk and claw after the kernels. No matter who has muddled up the issue, or how much a simple subject has been distorted by passion and prejudice, the inner matter is still there like the yellow inside of a multicolored Easter egg.

The particular argument in view, is that about discipline in the mines. This problem has always seemed an unpleasant one, but by the way some people wade into it, the subject seems to be as popular as muck-raking. Most of us like to shift the blame, and mine officials when they meet together, act as average humans would, and condemn the other fellow, who in this case is the employee.

One cannot help feeling, as one listens to their fulminations about the ill-regulated miner, that discipline should be defined as "the control of the workman, for the good of the employer." But if a doubt enters your mind, by all means foster it, because after all, much discipline doesn't work that way at all.

When Mike, whose room is not in shape, wanders around looking for the boss, because Jake was out on a drunk the night previous and didn't get the place cut, who is going to lose a day's work? And, if a few nights later, when Jake chooses to be sober, Mike has elected to go on a spree, Jake finds he hasn't a face to cut, and the next morning draws his statement and loses a few days to pack up and move.

And, if a fellow who has no use for the boss takes a skip along the rib as he drives up his room, he won't consent to draw the pillar and nobody else will want to do so either—so somebody loses what is usually accounted a snap,—the digging of coal with a loose end. The miner who lowers his heading, or gives it the staggering track of a man going through deep snow, or narrows it up, is making a death trap for some one, perhaps himself. It is usually the driver, however, who lies low in the rough-box as the result of such carelessness, and not the boss who relaxed his discipline and let an unsafe heading be driven.

When the miner's roof comes down on his back, it has killed him perhaps because he neglected to prop it. Would it be harsher discipline to send him home alive, to work on his tomato patch, than to regulate matters so that an ambulance is necessary? Popularly, it is a small error he has made to leave his props in a pile in a neighboring crosscut when they should have been on end in serried rows. But clearly the miner is wrong, *dead* wrong.

Why fill a page? Every man knows his part in promoting safety and should be disciplined if he does not do it. Is the operator, alone, to be blamed each time the roof falls on a miner, a driver is pinched, a mine blows up, or you get a place where the track isn't in shape? A man is a poltroon and fool, who whines at the boss for the follies of his fellows.

Of course, there's discipline for which no man should stand: Discipline of the strong man who oppresses the weak, an attempt on the part of the employer to get more from the worker than his contract will cover. On the whole, this is rare, because today the worker usually is effective in kicking, with a dozen mines bidding for his services and maybe a union looking for a scrap.

Discipline, like government, should be of the workman, by the workman, and for the workman. If it isn't, bureaus, mine officials, operators, inspectors, meet in vain. If we would knock off that one-tenth or two-tenths percentage of annual fatalities which holds the industry up to reprobation, the most insignificant of the workers must get busy.

Discipline is the worker's utmost need. It should be his main object and he should urge it, aid it—aye, enforce it. Unfortunately, there are some who regard license, not discipline, as the main object of every worker and of the union to which he subscribes. But the workingman should learn that it is to his advantage to lessen the losses of the industry

He is not so often the martyr of industrial selfishness as he is the victim of the conditions he himself has created.

Fuel Economy of Colliery Boiler Plants

By M. A. Walker

Investigations undertaken by the D. L. & W. Co. since 1908, followed by the introduction of improved methods and equipment, have effected a saving of 13½ per cent. in the cost of generating steam at the various colliery plants. It has been found possible to use coal, a large proportion of which is of a size smaller than any commercial grade, and still develop an excess of 60 per cent. over the rated capacity of the boilers.

It is only within comparatively recent years that the smaller or "steam" sizes of anthracite coal have come to possess a definite market value. Formerly, the grades now known as buckwheat, rice and barley were sent to waste to a great extent, and consequently when these sizes were utilized for generating steam at the colliery plants, it was considered that the cost of such fuel was practically *nil*, or at most, equal to the expense of separating it from the balance of the refuse.

Now, however, that this grade of material has obtained an established market, the mining companies of the anthracite region are coming to realize more and more generally that the coal burned under their own boilers represents an important item in the economy of operation. It is in short, chargeable against the power plant at a figure equal to the market price less an allowance for the cost of transportation, sales and handling.

In 1908 the coal department of the Delaware, Lackawanna & Western R.R. Co., realizing that it might be possible to effect important economies in generating power, undertook investigations, which have since resulted in a saving of considerably over 10 per cent. in their cost of generating steam.

The Lackawanna company operates 24 steam power plants, having an aggregate rated capacity of approximately 52,000 boiler horsepower. These are located in two districts; one, the larger, lying in the vicinity of Scranton, and the other, near Wilkes-Barre, Penn. Five of these boiler plants are required to render special service, two of the number supplying large central electric stations, one other serving two collieries and a washery, a fourth running a single washery, and the fifth being employed on development work. The remaining nineteen, however, may be said to be average colliery plants ranging from 1000 to 2500 boiler horsepower rated capacity.

The boilers installed at these various operations, are of both the water-tube and locomotive types. The latter are of 135- and 250-hp. capacity and are being replaced when necessary by larger water-tube units. All operate under forced draft, furnished either by centrifugal fans or steam jet blowers and are hand fired. Feed-water heating systems are installed throughout.

As previously noted, the several plants lie in two distinct districts. That in the vicinity of Scranton is divided for administrative purposes into three coördinate parts, which together with the Wilkes-Barre district comprise the four operating divisions of the company's organization.

Up to and including 1908, the boiler plants were under the special supervision of (1) a general foreman of boiler plants for all divisions, and (2) two boiler inspectors. One inspector reported to the superintendent of the Wilkes-Barre

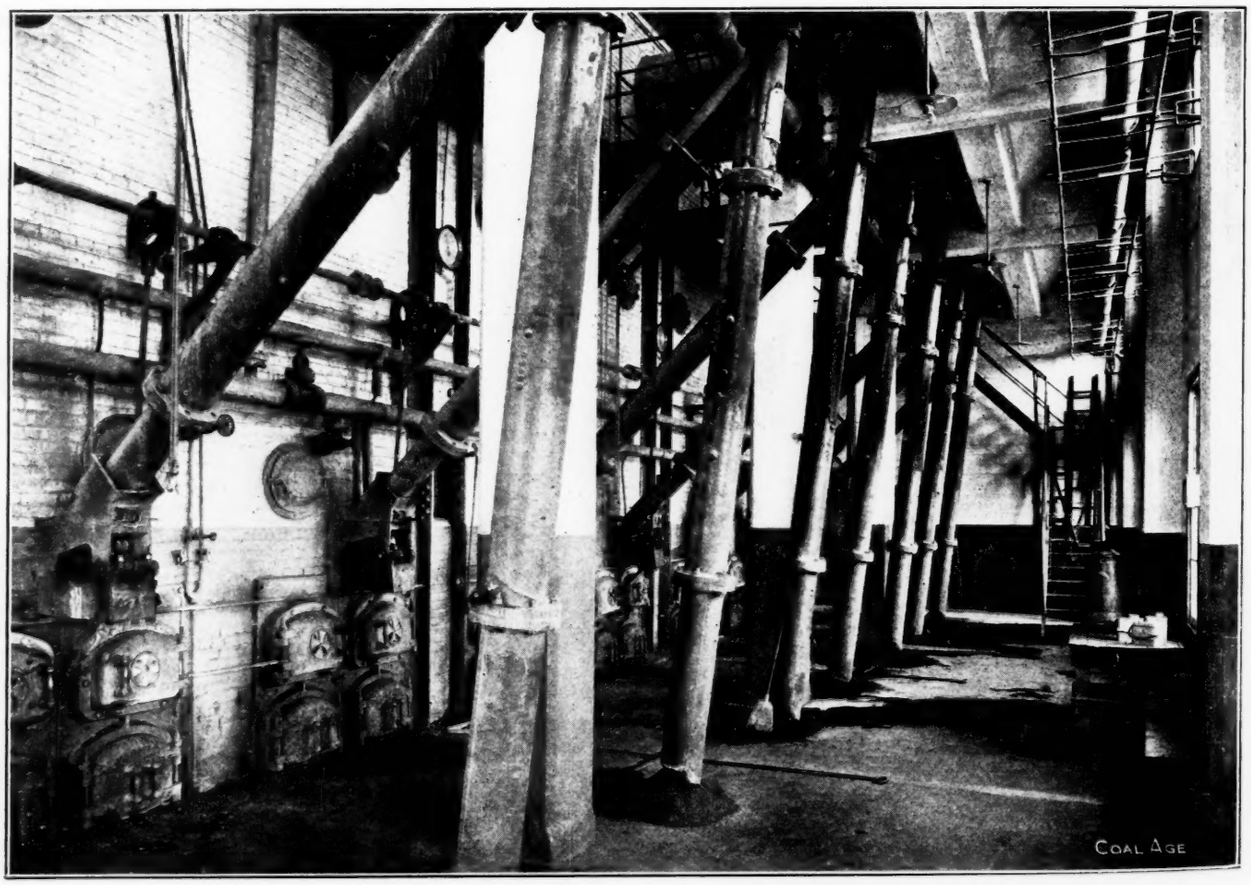


FIG. 1. FIRE ROOM FLOOR, BLISS BOILER PLANT, SHOWING OVERHEAD BUNKERS AND AUTOMATIC FEED

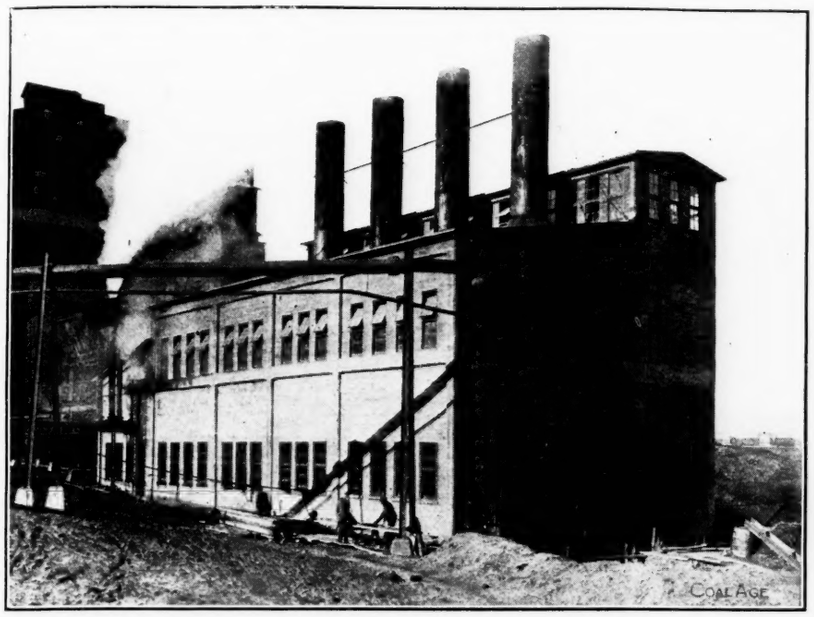


FIG. 2. STEAM PLANT, BLISS COLLIERY, NANTICOKE, PENN.

division and the other to a master mechanic having jurisdiction over the three divisions near Scranton. A floating gang of seven boiler makers and cleaners was available as needed. The duties of the general foreman were to oversee all plants, particularly in reference to the handling of fires, and also to make reports and suggestions regarding methods of operation, improvements, etc. He reported directly to the superintendent of the coal department.

During the year 1908 all power plants were turned over to the supervision of the company's electrical department and since 1909 this department has employed, in connection with this work, an operating force which is made up as follows: One general foreman of boiler plants, and one boiler inspector, both report directly to the office of the electrical engineer. A force of boiler makers and cleaners is maintained, in charge of the boiler inspector.

Each boiler plant has one chief fireman and most of them have two, one for day and one for night shifts, the latter reporting to the day man. The general foreman has charge over all these men insofar as pertains to methods of firing and general operation, improvements, repairs, etc. The actual working of the plants remains, as previously, a function of the colliery.

When, in 1908, the electrical department took charge of the steam generating equipment with the idea of effecting a substantial saving, their attention was first directed to the coal pile, and during that year as much barley coal as possible was burned, keeping the larger sizes down to a minimum. Previously, large quantities of rice and buckwheat coal had been used.

Tests were conducted to determine the quantity of fuel used at each plant per pound of water converted into steam. At operations where coal was delivered to the boilers by means of transportation cars, the amount of fuel consumed was known exactly, and where fuel cars were used the amount was known approximately. In cases where the coal was brought in directly from the breakers by means of scraper lines, however, it was necessary to make tests at intervals, by weighing all the coal fired during a certain period of time—say, 24 hours. These tests gave figures from which it was possible to estimate the amount of fuel used during working hours and also during idle hours, as at night and on Sundays and holidays.

In order to determine the amount of water being supplied to the boilers, the feed pumps at all the larger plants were equipped with counters. This method being more or less crude and inaccurate, however, the department began, in 1909, to install Venturi meters, and by 1911 all plants were so equipped. These meters are of the recording type and charts from each, covering a 24-hour period, are now sent in daily. The charts are gone over with a planimeter and a record is kept of the amount of water evaporated at each plant during both day and night shifts.

During the latter part of 1910, the subject of fuel meters was investigated, and on the basis of the results obtained from these tests, a sufficient number of Havard meters were purchased in 1911 to equip all plants where the fuel was not brought in by either transportation cars or fuel cars. The method of installing these meters in connection with a scraper line from the breaker is shown in Fig. 4. It will be noted that only one meter is required by this arrangement, whereas the more usual method of placing meters at each outlet from the boiler-room bunkers requires at least as many meters as there are boiler settings.

At the end of the year, 1908, although the methods then in use for determining the output were crude, it was quite evident that the size of the fuel burned could be materially reduced, and after making an investigation of the various types of grates which were then installed, new grates were designed which would enable much smaller sizes of coal to be burned. These new grates are of both

FIG. 3. ALLEYWAY AT REAR OF BOILERS, BLISS POWER PLANT

the stationary and dumping types, the latter being used in connection with the locomotive boilers. Air is admitted through pin holes which give a total of from 5 to 7 per cent. of air space. In general, the stationary type of grate may be said to give better satisfaction, in that the percentage of air space is not subject to the variation entailed by the moving parts which are necessary to secure a dumping equipment.

As a result of the foregoing measures, during 1909 very little rice and buckwheat coal were burned, nearly all the fuel that was used being of barley size. Continuing along these lines during the latter part of 1909 and in 1910, an effort was made to burn No. 2 barley, a size passing through $\frac{3}{32}$-in. and over $\frac{3}{64}$-in. round mesh. At the same time the amount of No. 1 barley, rice and buckwheat being fed to the boilers, was cut down so that during 1911 a large percentage of barley No. 2 was used, and the total amount of the larger sizes of fuel burned was materially decreased, although the aggregate tonnage of fuel consumed was larger in 1911 than in 1910. This latter fact was due partly to the large percentage of barley No. 2 which went out unconsumed with the ash and also to the general increase in the load on the plants. A comparison of the percentages of the different sizes of fuel burned during the years 1910 and 1911 is given in Table No. 1.

The total tonnage of fuel consumed was decreased in 1909 and again in 1910, but in 1911 the amount increased to a little over that of 1909. It should be noted in this connection that the amount of water evaporated in 1911 was 2.4 per cent greater than during the previous year.

TABLE I

Sizes of coal used, expressed in percentage of total fuel consumption

	1910	1911
Buckwheat	3%	0.9%
Rice	14%	4.9%
Barley	71%	73.5%
Barley No. 2	12%	20.7%
Total	100%	100.0%

Since 1908, the figures obtained from the various power plants of the Lackawanna company have been such as to give what practically amounts to the results of a continuous boiler test. They are more or less crude and inaccurate for 1908 and 1909, but are accurate for 1910 and 1911, especially for the latter year. In addition to the records of fuel consumed, water evaporated, etc., an accurate account is kept of the cost of operation for each plant month by month. This record is divided into "running expenses" and "repairs and renewals." Under the first head, the costs for labor, fuel and other materials such as oil and waste are noted, and, similarly, the charges for repairs and renewals are divided into items of expense for labor and material. Fig. 5 shows in blank the monthly reports submitted by each operation, and in Fig. 6 is given an outline form of the yearly record kept for each plant.

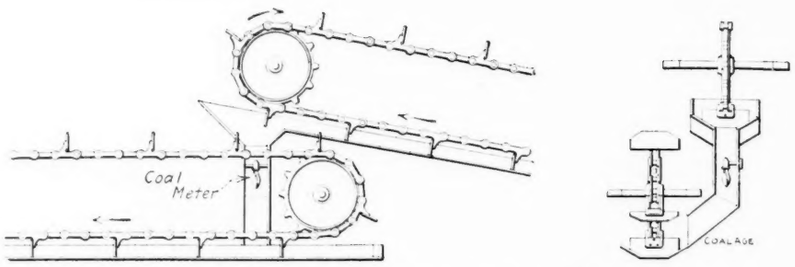


FIG. 4. METHOD OF INSTALLING COAL METER ON SCRAPER LINE

In this way the total cost of operating every plant is known for each month. The amount of water evaporated is known and the two items, cost of steam per thousand pounds, and amount of water evaporated per pound of coal, are easily determined. On the basis of the same prices for fuel, a saving of 13½ per cent. was effected in 1911 over 1909. This represents chiefly a saving in fuel, although some reduction was made in labor charges. As an average figure, it is found that 4 lb. of barley coal are required per horsepower-hour of boiler output. Steam pressures of from 125 to 150 lb. are maintained at all the plants. The chart, Fig. 7, gives a graphic comparison of the total operating costs of all plants, for the years 1909, 1910 and 1911. The costs for 1910 and 1911 are shown as percentages of the costs for 1909, which are used as a basis.

An important factor in securing these results has been the method of organization of the supervising force and the measures taken to effectively coöperate with the operating force at the collieries. As previously noted, the plants are distributed, geographically, in two general divisions. Once a week the chief fire-

Covering Cost of Operation at .....Boiler Plant
for Month of .....19....

Running Expense	Labor	Material	Total	Hours Breaker Worked
Chief firemen				Date
Firemen				1
Handling fuel				2
" ash inside				3
" " outside				4
All other labor				5
Cleaning boilers				6
Tons of buck				7
" " rice				8
" " barley				9
" " " No. 2				10
Total tons				11
Gals. city water				12
Oils, tools, cotton waste, etc.				13
Feed water treatment				14
				15
Total running expense				16
Repairs and renewals				17
				18
Boilers				19
Grates				20
Feed pumps				21
Ash flushing pumps				22
Fans and engines				23
Steam blowers				24
Feed pipes				25
Steam pipes (inside plant)				26
Blow-off pipes				27
Feed water regulators (make)				28
" " " "				29
Ash bore hole				30
Coal conveyor				31
Ash "				Total
Mason work:				
Arches				
Fire box lining				
Baffles				
Side walls				
External boiler settings				
Ash pit				
Building				
Total mason work				
Total repairs and renewals				
Total operation				

Remarks .....

Total tons of coal prepared .....
Approved. ....
Outside Foreman Chief Fireman

FIG. 5. MONTHLY REPORT FOR EACH PLANT

Colliery	Year	Running Expenses				Repairs and Renewals			Total Expense	Water Evaporated	Cost per 1000 Lb. of Steam	Fuel Consumed					Water Evaporated per Lb. of Coal
		Labor	Fuel	Other Material	Total	Labor	Materials	Total				Buck	Rice	Barley	No. 2	Total	
	1908																
	1909																
	1910																
	1911																
	1912																
	1913																
	1914																
	1915																

FIG. 6. RECORD OF YEARLY COSTS FOR EACH PLANT

men from each district get together for a meeting with the general foreman of boiler plants, and at these meetings, the general foreman goes over with them, various questions pertaining to operation, firing, etc., and gives all necessary instructions.

The men freely discuss various fireroom practices, ways for dealing with the men employed, and methods of procedure in case of accident. Also the monthly reports from the different operations are gone over and discussed. These reports are prepared at the colliery by the chief fireman and the colliery clerk and are signed by both the chief fireman and the outside foreman. Fig. 5 shows the blank form of report in use.

In conclusion it should be noted that a saving of 13½ per cent. in the cost of generating steam at plants which already were operating with an efficiency probably above the average for colliery power houses, is an attainment of no small importance. The experience of the D. L. & W. company has demonstrated that with proper facilities a size of coal smaller than any present commercial grade can be used successfully, and the consumption of buckwheat and rice practically eliminated at colliery plants. The cost of this small size, or barley No. 2, is almost nominal, since it can be recovered from the refuse at very little expense.

But, perhaps the most significant phase of this accomplishment is the fact that by careful attention to the details of operation and equipment it has been found possible to develop with these small sizes of fuel an excess of at least 60 per cent. above the rated capacity of the boilers, whereas previously with the same grade of fuel it was found impossible to develop even the rated output.

Obviously, it pays to know definitely and with considerable exactness just what a plant is doing. There always will be more or less latitude in the matter of choosing methods and equipment to effect a certain saving, but any effort at economy is little better than a guess without reliable data on which to base it, and the operation of the usual colliery boiler plant is often a matter of considerable mystery, even to those most nearly concerned.

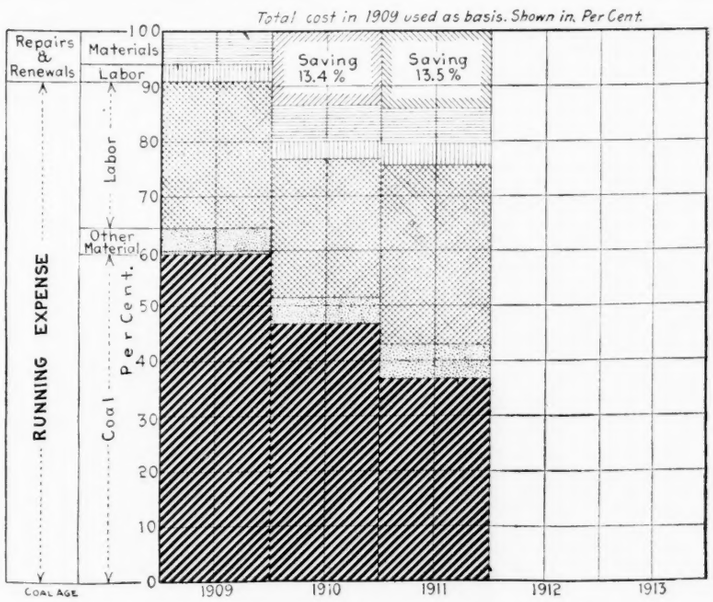


FIG. 7. TOTAL ANNUAL COSTS FOR STEAM SHOWN AS PERCENTAGE OF TOTAL COSTS FOR 1909

The work outlined in this article has been conducted under the direction of H. M. Warren, electrical engineer, Coal Mining Department, D. L. &. W. R.R. Co. and C. A. Conant, his assistant, to whom I am indebted for the information set forth.

Bohemia as a Coal Producer

There is little coal imported into the central district around Prague as there are extensive deposits of bituminous coal in the vicinity of Kladno, where are also located steel works and furnaces.

In northern Bohemia, in the vicinity of Teplitz and Brüx, are immense deposits of brown coal or lignite. There are also good coal deposits in Moravia. Germany exports coal to the factories in northeastern Bohemia, as the freight to that territory is less than from the Bohemian coal fields.

Coke is also imported from Germany, as it contains less sulphur than the Bohemian product. It is used in American baseburner stoves, which have a good sale in Bohemia. Hard coal is also used in these stoves, but in limited quantities, as it costs $15.83 a ton. There are possibly 400 to 450 tons of hard coal sold here annually. Large quantities of brown coal are exported from Bohemia to Germany. In 1909 the exports were 1,620,000 tons and in 1910, 1,535,000 tons. In 1911 the exports by way of the Elbe were much less on account of the low water during the summer months.

The freight in Bohemia is high. From Bodenbach, the frontier between Germany and Bohemia, to Prague, less than 80 miles, the freight on 10 tons of coal is $13.16, while from the seacoast at Stettin, Germany, to Bodenbach, 226 miles, the freight is but $22.25 for 10 tons.

At the explosion which occurred in the Sykesville mine, central Pennsylvania, resulting in the death of 21 men, the bodies of 17 men showed no marks of violence such as would be produced by the concussion of an explosion. Blood from some of the bodies of the men when diluted in water showed the bright pink hue caused by carbon monoxide.

Notes on the Impurities in Coal

By F. R. Wadleigh*

An interesting and practical monograph on the effects of the different impurities in coal. According to the author there is surprising lack of knowledge on this subject even among the largest steam users. Special attention is devoted to the clinkering of fuels and the causes and remedies for same.

*Fuel engineer and assistant general manager, the Chesapeake & Ohio Coal & Coke Co., Norfolk, Va.

Little satisfactory information regarding the impurities found in coal, their nature and appearance, action in the furnace and effects on combustion, is to be found in text books, or technical literature generally. When the subject is mentioned it is usually dismissed in a few lines, or at most, in two or three short paragraphs, which discuss merely the effect that ash in general has upon fuel economy and combustion, but do not go into the question of the nature of the ash, or describe the effect which its different constituents have in reducing the efficiency of the coal, and in causing the formation of clinkers. Descriptions of the various impurities, how they came to be in the coal, and how they may be detected, appear in very few text books.

The General Prevailing Lack of Knowledge

And further it is surprising to note the lack of knowledge on the part of practical men among the engineers and firemen, regarding the same subject. Most of them know that some coals clinker badly and that others do not, that some make a porous, light clinker, large in size possibly but easily handled, while others make a thin, heavy clinker that sticks to the grates and is hard to remove. But they are unable to give a reason for the difference in clinkers, why impurities will fuse or cause the others to fuse, how many impurities can be detected in the coal and removed or how a change in firing methods will often reduce the clinkering of coals; on these points they do not seem to have made the use of their powers of observation or their reasoning faculties. Their superior officers are generally not much, if any, better informed, and I have come across several amusing instances of the lack of knowledge regarding coal impurities on the part of the officers in charge of steam plants and fuel handling.

One incident was that of a large steamship company, who after receiving a cargo of the same coal they had been buying for years, made a strong complaint regarding this shipment on account of the large amount of sulphur it contained. Accompanying the complaint was a box containing pieces of ordinary Sicilian sulphur, some of them larger than my fist, stating that this sulphur had been found in the coal and had given serious trouble. As the coal in question is noted as a low sulphur product and as sulphur never was known before to appear in this shape in coal, an investigation was made, which showed that the ship had, on the previous voyage, taken a cargo of sulphur from Sicily. The pieces of sulphur found had, of course, been left in the hold after discharging and become mixed with the coal.

Another instance was that of a large manufacturing concern in New England who complained that a certain lot of coal made a great deal more smoke and clinker than previous shipments of the same kind, and they sent several lumps to show that the quality was poor. These samples were sent to a well-known chemist who reported the following analysis, on which comment is unnecessary:

Moisture	1.230
Volatile matter	18.121
Fixed carbon	78.492
Ash	1.595
Sulphur	0.562

It would seem, therefore, that some description of the impurities found in coal, would be of considerable value to the consumer and it is my intention to give a brief statement of our present knowledge on the subject.

The Two General Methods of Detecting Impurities

Impurities in coal are detected either by a simple examination of the physical properties or by a chemical analysis. Those which may be found by the former method are either of (a) sedimentary origin, deposited during the accumulation of the vegetable matter forming the coal, or (b) were caused by the water which percolated through the beds of vegetable matter, and, to some extent, from the ash of the vegetable matter itself. Class (a) includes slates of every kind, clays and bone, while under class (b) come iron pyrites, carbonate of lime, and sulphate of lime.

Impurities that can be detected only by chemical analysis of the ash, or by their effect on the combustion of the coal, are all of mineral origin and derived from the ash of the vegetable matter from which the coal was formed, also to some extent from the water running through such vegetation and the beds of coal.

In this class are free and organic sulphur; the latter found in combination with carbon and hydrogen, magnesia, iron oxides, phosphorus, potash and soda and arsenic, silica and alumina. These substances, all oxides, are found both in the physical impurities and in the coal itself, so that coal which has been thoroughly picked and cleaned as far as can be seen by the eye, will still contain varying amounts of each.

In addition to those already given, moisture and oxygen must also be classed as impurities, since their presence in the coal lowers its heating value. There are also some other impurities found in the ash of coal, but their amount is so small that the effect they have on combustion is of no consequence; these are copper, antimony and the various sulphates.

Ash

All of the impurities mentioned, excepting moisture and oxygen, make up the ash (including clinkers) of coal, so that it will be in order first to give some data regarding ash and clinkers and their general effect on the combustion of coal. It will then be shown in a general way, the effect which each of the impurities has on the character of the ash, as well as their appearance, when they can be detected by the eye.

Ash in coal is a dead loss, as far as fuel value is concerned, and when it reaches a certain percentage the coal is practically useless. It not only decreases the amount of combustible in the coal, but its temperature must be raised to that of the fire and it must be removed in a more or less heated condition, carrying off heat, together with a certain percentage of unconsumed carbon, the amount of the latter depending on the condition of the grates, furnaces and the skill of the fireman. A large percentage of ash will also increase the labor in the boiler room and may make it necessary to employ extra help,* or add to the boiler capacity of the plant. In addition it clogs up the furnace and hinders combustion, while there is also a further loss due to the cost of moving ashes.

Tests made by W. S. Abbott ("Proceedings of the Western Society of Engineers," Sept. 5, 1906) showed that besides the action of ash as a dilutent to the coal its effectiveness was reduced to zero when 40 per cent. ash was present, although the remaining 60 per cent. was pure coal. The ash not only obstructs the supply of air through the fuel bed, giving incomplete combustion, but also reduces the percentage of fuel on the rear of the grates, so that a sufficiently large amount of air does not combine with the fuel, but

*Where the physical conditions at a power plant are such that the cost of handling the ashes runs excessively high, the selection of the fuel may hinge entirely on this point.—Editor.

passes into the furnace as free air, resulting in a lower furnace temperature. This, besides making smoke, reacts on the fuel bed, reducing the rate of combustion and increasing the adulteration of the furnace gases with free air.

Clinkers

An accumulation of clinkers in a boiler furnace is one of the most annoying things about a power plant or in locomotive operation and is the cause of many shutdowns and much lost time. It either cuts off the air supply almost entirely or causes an unequal distribution of air to the fire. It takes up valuable room in the furnace, which results in the loss of considerable heat and partly burned coal, sticks to the walls of the furnace, eventually destroying the brick and cutting off grate surface and is altogether a nuisance to the fireman and a cause of serious loss to the owner of the plant. Clinkers in the locomotive firebox are not so detrimental as in the stationary boiler plant, as the former is always equipped with shaking grates and the draft is stronger, so that more air is "pulled" through the fire. In marine work they are the source of a great deal of trouble and loss owing to the limited space and heat in the stokehold and to the fact that the fires must be cleared while the screw is making the required number of revolutions, without any loss in steam pressure; only a comparatively few ships boilers have shaking grates.

The cause of the formation of clinkers from the ash is a subject to which little attention has been given until recently, notwithstanding its importance to both the buyer and the seller of the coal.

Clinkers are due to the temperature of the fuel bed reaching the temperature at which the ash will fuse, so that their formation depends upon the fusing point of the ash and the temperature to which it is subjected. The presence of certain proportions of iron oxides, lime, magnesia and alkalies will lower the fusing point of the ash, while high rates of combustion and frequent stirring and slicing of the fire will increase the temperature to which the ash is exposed.

It must be understood that these substances and the other oxides are not fusible themselves, but unite to form compounds that are fusible. Lime, for instance, will not of itself fuse under any temperature, but when combined with silica and alumina may cause the formation of a slag, readily fusible at quite ordinary furnace temperatures.

It should be stated, in this connection, that the more silica or alumina present, the more lime required to make a fusible ash. Dr. Fulweiler gives the following advice, applying to the constituents of ash:

Avoid an ash containing:

	Per cent.
Silica below	30
Alumina below	30
Iron oxide above	15
Lime above	10
Magnesia above	3

The slag forming property of lime may be seen at any blast furnace, where a certain amount of lime is added to the mixture of ore and coke to form a slag with the silica and alumina and other impurities that may be easily removed from the iron. For instance, in the Pittsburg region furnaces, about 1200 lb. of limestone, 2200 lb. of coke and 4000 lb. of ore are put in each charge which produces one long ton of pig iron.

Varieties of Clinkers

The distribution of the mineral constituents in the coal also has considerable effect on the clinker formation. Where much of the coal is in small particles, the ash (being heavier than the coal) will usually work down to the lower part of the fuel bed where the heat is not so great, and hence will not clinker so readily. Fineness in the subdivision of the ash is also a factor.

There is also a great difference in the appearance of clinkers. Some are a light gray color, thick, but light, porous and friable; others are of a reddish brown, thick, hard and heavy, or of dark brown tipped with jet black, thin, and heavy. I have seen clinkers, formed from the coal of the Cauca Valley in Colombia, S. A., that were of a bright yellow on the outside and jet black inside.

The thick, heavy clinkers, as well as the porous ones, do not, as a rule, adhere to the grates and can be readily pulled out, while the thin clinkers often run all over the grates, especially if the fires are forced. These latter are of about the consistency of molten iron, so that when the slice bar is run under the fire the pasty mass will adhere to the bar and follow it out like molasses on a stick. Some coals will form a clinker in a very few hours, whose size is only limited by the size of the grates, while that from other coals will be insignificant in size and weight and of little detriment to combustion. With some of the New River-Pocahontas coals of West Virginia I have seen fires run for 84 hours without cleaning and with the boilers working at their rated capacity; on locomotive work I have also seen runs of over 200 miles without shaking grates, the fire being in better condition at the end of the run than at the start.

Some coals will, at the end of three or four hours, make such troublesome clinkers that the fires must be thoroughly cleaned in order to keep up steam. It should be said, in this connection, that clinkering coals may be burned with much less trouble on locomotives than under stationary or marine boilers. The temperatures in stationary-boiler furnaces are higher than in locomotive fireboxes and the fires are sliced and disturbed oftener, while in marine work there is usually a continued leveling and slicing of the fires.

The Worst Type of Clinker

In the Pennsylvania R.R. locomotive tests at St. Louis, using a selected high-carbon Pennsylvania coal, the firebox temperature ran from 1400° to 2000° F. when working light and from 2100° to 2300° working hard, the maximum having been 2339°. In the U. S. Geological Survey tests at St. Louis under stationary boilers (Bulletins 290 and 322), taking the Pennsylvania, Virginia and West Virginia coals, the average furnace temperature of 62 tests was 2444°, the lowest 2220° and the highest 2864°.

Of two coals, the one that makes the most clinker is not always the one that will give the most trouble as it may make a large and heavy or a large and porous clinker that does not stick to the grates, while the other may make a thin glassy clinker that will stick to the grates, stop up the air space and be difficult to remove. Coals which form a sticky clinker may often be burned without much trouble by spreading a layer of limestone over the grates after the fire is spread; the limestone cannot be fused and will keep the clinker from adhering to the grates.

It has been my experience that the worst clinker to handle is formed from a comparatively low-ash coal, having high percentages of lime and iron oxides; some of this clinker (that next to the grates) is jet black and looks like tar. An analysis of such clinker and of the coal from which it came is given as follows:

COAL

Moisture	.496
Volatile matter	19.139
Fixed carbon	75.530
Sulphur	.48
Ash	6.36

CLINKER

	T	B
Silica	43.24	34.80
Alumina	23.74	23.30
Iron oxide	10.64	11.64
Lime	16.44	23.50
Magnesia	2.88	3.65
Undetermined	3.06	3.11

T is the top clinker, reddish brown, with a rough surface, and B is the bottom clinker, jet black, with a polished surface.

The top clinker was the ordinary kind usually formed from this coal, except that it was heavier and not so porous. The bottom clinker was thin, soft and pasty (when hot) and ran down through the air spaces in the grates in long black threads, reaching all the way to the ash pit, so that it was impossible to get the slice bar under it; it had to be chipped off the grates when cold with a chisel bar.

Causes of Clinkering

It should be stated that the varying amounts of the fluxes (lime, etc.) and

their relation to each other are very complicated and little understood. Dr. Seger has shown (E. C. Bailey) that while the addition of such substances up to a certain point, will lower the fusing temperature, increasing the amount will likewise increase the fusing temperature.

We may conclude, therefore, that the best way of determining the clinkering properties of a coal is to find the fusing point of the ash. As illustrating this point, the following table of tests of the fusing temperature in degrees Fahrenheit of coal ash is given, compiled from Bulletin No. 3, Fuel Testing Co., Boston, and from the paper of E. G. Bailey, read before the Ohio Society of Mechanical Engineers, November, 1911:

Character of coal	Fusing temperature of ash	Per Ct. Ash	Per Cent. Sulphur	Per Cent. Iron oxide
Anthracite	3150	15	0.76	—
Semibituminous	3070	15	1.36	—
Semibituminous	2910	8	0.96	7.0
Semibituminous	2880	7	0.70	10.0
Semibituminous	2830	14	1.78	—
Bituminous	2750	11	0.60	—
Semibituminous	2750	6	0.71	—
Semibituminous	2710	8	0.96	7.90
Semibituminous	2680	11	1.00	—
Semibituminous	2640	9	1.25	12.0
Gas	2640	9	0.72	6.6
Semibituminous	2610	9	2.14	—
Semibituminous	2610	9	1.29	—
Semibituminous	2550	13	3.10	23.7
Gas	2520	7	1.22	13.0
Anthracite	2520	10	0.61	6.1
Bituminous	2510	8	1.12	—
Semibituminous	2480	5	0.76	—
Gas	2460	7	2.35	24.7
Coke	2460	9	0.80	—
Bituminous	2450	7	0.84	—
Semibituminous	2140	9	3.42	—
Bituminous	2360	9	2.29	—
Semibituminous	2320	13	0.92	7.1
Gas	2300	7	0.98	10.6
Bituminous	2280	10	3.10	—
Gas	2260	7	3.12	34.0
Semibituminous	2250	7	0.73	12.9
Coke	2190	10	1.40	13.9
Semibituminous	2170	5	0.74	—
Semibituminous	2160	6	0.76	—
Bituminous	2140	21	—	—

Note—The ash and sulphur percentages given are of the coal analysis and the iron oxide percentage is of the ash analysis.

A study of this table will show the fallacy of the long accepted idea that clinkers are caused by sulphur and iron in the coal and that the color of the ash is a sure guide to the clinker-forming qualities of the coal. There is absolutely no relation between the sulphur content and the fusing temperature of the ash, which is not surprising when we remember that much of the sulphur burns and passes off as a gas.

In this connection, attention is called to the buying of coal on specifications, many such contracts penalizing heavily for excess of sulphur over guarantee, on account of its supposed clinker-forming tendency. One contract of this kind reads: "For every 1 per cent. of sulphur or fraction thereof above the guarantee (0.9 per cent.) five times such percentage may be deducted from the selling price." This is all wrong and extremely unjust to the coal operator; the sulphur in this case may easily run to 2 per cent. without causing any perceptible loss in the efficiency of the coal. Yet this contract was issued by the largest company of its kind in this country and called for 60,000 tons of coal.

Effects of High Temperatures and Methods of Firing

The intensity of combustion of the coal has much to do with the formation of clinkers, and coals that will clinker badly under some furnace conditions, will clinker very little under others. It would take an extremely hot fire to cause clinker to form from a coal, the fusing temperature of whose ash was 2910° F. (see table), while the coal with an ash-fusing temperature of 2250° F., would fuse under ordinary conditions.

The method of firing may also have much to do with the formation of clinkers. The fireman who carries a heavy fire and is continually using the slice-bar, thus bringing up the ash on the grates into the hottest zone of the fire and increasing the temperature on the grates by turning his fire up-side down, will surely have more clinkers and harder work cleaning fires than the man who is satisfied to let the ash stay where it belongs, on the grates. On locomotives, the failure of the fireman to build up the fire properly before starting is a prolific source of trouble from clinkers, especially with the high-carbon coals.

To prevent clinkers from adhering to the grates, steam may sometimes be successfully used by blowing it under the grates. The use of crushed limestone or oyster shells spread over the clean fire as soon as it is started after cleaning, will also help to prevent clinkers from reaching and adhering to the grates.

An instance of this latter method is given in Bulletin No. 235, U. S. Geological Survey, describing tests on two different coals. In the first test of these coals, without using limestone, it took 45 and 30 min., respectively, to clean the fires, while in the second test, using limestone, as described above, it took but 8 and 10 min. for each cleaning.

I observed the "oyster-shell method" at a steam plant on the coast in Virginia. The coal used clinkered badly, and, on examination, the surface of the lumps was seen to be covered with whitish-brown scales of carbonate of lime, a sample of which yielded the following analysis:

Silica	0.375
Alumina	0.100
Iron oxide	1.55
Lime	86.82
Magnesia	2.118
Alkalies and undetermined	9.036

The clinkers formed were thin but stuck closely to the grates, and it was found necessary to shut the plant down to clean the fires. After cleaning was completed and a new fire built, the old negro fireman procured a lot of oyster shells and spread them in a thin layer over the fire. At the end of the day's run, the fires were cleaned easily and the clinkers had not adhered to the grates.

Recent Studies on Clinkering

E. G. Bailey and W. B. Calkins have been recently making a thorough investigation of this subject and some of their conclusions have been published in a pamphlet, issued by the Fuel Testing Co., and in a paper read by the former gentleman before the Ohio Society of Mechanical Engineers, reference to which has already been made.

L. S. Marks, of Harvard University, has also lately made a series of investigations on the formation of clinkers, and his experiments and conclusions are given in detail in the *Engineering News*, Vol. 64, No. 23. His conclusions are summed up as follows: That the elements causing clinkering are principally iron, calcium and sulphur, but that the exact amounts of each of these which may be present without causing clinkering is not known with enough accuracy to permit the use of any formula.

Prost's formula is correct in a general way, but cannot be relied upon for any particular coal. The main idea of this formula is that the temperature of fusion is increased by increasing the alumina and decreased by the substitution of other constituents for the alumina; that the only real cure for clinkering is low-temperature combustion; that if the temperatures are high, the trouble from clinkering can generally be lessened by the use of steam or by the addition of Kaolin or pure quartz, both of which are too expensive for commercial use.

Visible Impurities in Coal

All persons concerned in the purchase and handling of coal should learn the appearance of the different impurities, such as slate, bone, iron pyrites, fireclay, etc. Knowledge of these impurities is of value, as by throwing them aside in the boiler room, better results may be obtained from the coal and less ash and clinkers produced, while a poor lot of coal may be detected before it has caused trouble. The effect of the different impurities on the burning of the coal should be watched, as all such knowledge tends to more economical results.

There is, of course, a vast difference in the impurities among the different coals. Some coals are apt to have considerable slate, others slate and bone, etc., the presence of such impurities being mainly caused by lack of proper preparation and inspection by the mine operator.

Slates—Slates are of irregular shape, generally more or less flat, heavier and harder than the coal, and vary in size. Their color runs from a light gray to black. Some of them are soft and easily broken, while others are very hard. They may come from the roof of the mine, or may be found in layers or partings in the coal bed.

Their effect on the fire is to add to the amount of ash and refuse; they take up space on the grates that would otherwise be occupied by coal and they also add to the size of clinkers. Slates have no value as fuel.

Bone and Boney Coal—Bone may be called a slaty coal or a carbonaceous slate. It is really coal carrying slate, not laminated, but in small particles mixed with the coal. It is harder and heavier than coal, of a dark color and breaks in irregular-shaped pieces. Sometimes it will be found in small pieces separate from the good coal, and sometimes it shows in a layer in a large lump, just as it comes from the seam. It is usually from ½ to 4 or 5 in. thick.

It will not clinker, and its only effect on the fire is to add to the amount of ash and take the place of better fuel. It has a certain fuel value, although varying considerably in this respect; usually the harder it is, the less the fuel value. Analysis shows that it contains from 15 to 25 per cent. ash, while the clean coal will not have over 7 per cent.

Fireclays—Fireclays come in small pieces or layers in the coal, usually soft, like putty, and are generally of a light gray, or reddish-gray color. They are commonly found below the seam, but sometimes in the middle in thin layers. They add to the amount of ash and clinkers and have no value as fuel.

Iron Pyrites—This substance is of a bright yellow color, resembling gold or brass, appearing sometimes in thin layers or flakes, while at others in hard, round, or partly round balls, and often in lumps more or less mixed with other substances.

It is composed of iron and sulphur (FeS_2), and not only has no fuel value, but may be one of the causes of clinkering. Some coals contain very little pyrites, only a few small flakes on the surface of the lumps, while other coals have a large percentage.

Lime—On the surface of the lumps of some coals may be seen layers or flakes of a whitish-brown substance. This is a form of lime (carbonate) and is sometimes responsible for considerable trouble, as it may lower the fusing point of the ash, and make a sticky, pasty clinker that runs into the spaces between the grates and stops them up, especially if the fires are sliced or stirred much.

The amount of lime found in coals may vary greatly in different parts of the same bed, as well as in different coals. Examination of these scales or layers under the microscope show them to be composed of small shells, evidently of marine formation.

Determination of Generator Capacity for Mine Haulage

By E. B. Wagner*

Determination of the generator capacity required to successfully operate an electric haulage for mine service, presents a problem, the conditions of which are peculiar to itself. A comparison with a street-railway system may serve to emphasize some of these points of peculiarity. With a trolley car system of moderate size, the power required for any one unit is small as compared with that needed for the total number of units in operation, so that the shutting down of several units produces but a small effect on the total load. In addition, the cars can be run on schedule, thus determining with considerable exactness the maximum load conditions.

The average mine haulage equipment, on the other hand, will usually consist of from five to ten locomotives, the stopping or starting of any one of which will produce a relatively large variation in the total load on the generator. Another unfavorable condition under which a mine haulage system operates, is the impossibility of running on a regular schedule, since the locomotives are dependent for their operation upon the supply of mine cars. If these are plentiful, the locomotives can be kept busy with but few delays, giving a reasonably uniform load.

On the other hand, when the cars come irregularly the locomotives have to wait for their trips, resulting in periods of load and no load upon the generating plant. This condition is somewhat similar to that which exists at a street railway power house when a circuit breaker blows out and is subsequently reset. However, equipping the locomotives with automotoneers somewhat decreases the heavy current required for starting, by increasing the time necessary to bring the controller handle to the full load position.

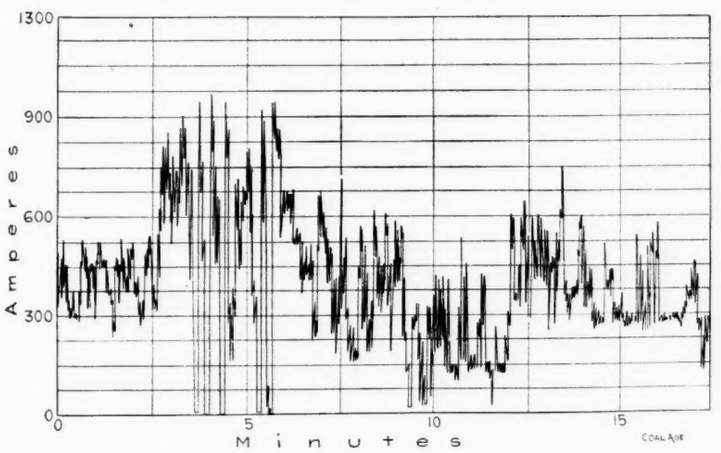


Fig. 1. Typical Load on Mine-haulage Generator, Record by a Graphic Ammeter

The curve, Fig. 1, taken by a graphic ammeter, shows a typical load on a generator furnishing power to a mine haulage system. The great irregularity of the load is at once apparent. Peaks of 800 amp. alternate with periods of light load, and at no point is the load constant for even a minute of time. If this curve were recorded for the entire working day and the result averaged, it would be found that the average load was in the neighborhood of 300 amp. It is clearly impracticable to obtain a generator rated at 300 amp., that will carry an overload of 300 per cent. as a regular thing. Hence, some point between these limits must be decided upon, and this taken as the full-load rating of the generator.

The purpose of this article is to suggest a method for readily determining the generator capacity required for a mine haulage system, when there is known only the number and size of the locomotives which it is desired to operate. Obviously, the larger the locomotives, the greater will be the power required for their operation, and it is evident that the generator capacity can be expressed in terms of kilowatts per ton of the locomotive weight. Such a unit value having been obtained, this figure multiplied by the total tonnage of the locomotives will indicate the size of generator required.

Another factor must be taken into account, however. The ratio of the average load on a mine haulage system, to the maximum load, is determined by the number of locomotives in service. The greater the number of locomotives, the closer the average load approaches

*Assistant electrical engineer, Lehigh Valley Coal Co., Wilkes-Barre, Penn.

the maximum, and the smaller the number, the greater the difference between these two values. This is, of course, assuming average colliery conditions of service, in which each locomotive runs intermittently throughout the day. Therefore the factor, "kilowatts per ton," is not a constant but varies with the number of locomotives to be used. With one locomotive, the generator capacity must be nearly equal to the locomotive capacity, or the maximum demand, while with a large number of locomotives it can be relatively smaller.

The curve, Fig. 2, gives values of the factor "kilowatts per ton of locomotive weight," for various aggregate tonnages of locomotives. This curve applies to locomotives of a weight up to 13 tons,

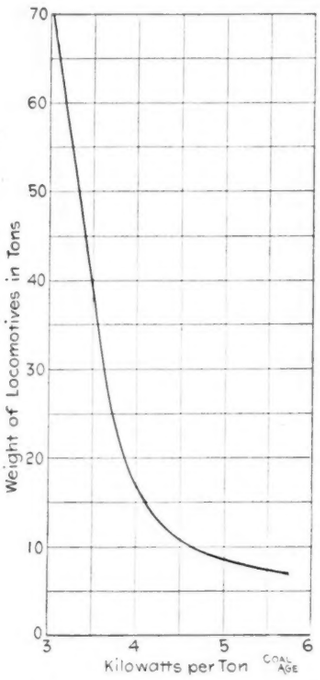


FIG. 2. CURVE OF KILOWATTS PER TON OF LOCOMOTIVE WEIGHT

and has been derived from figures taken from actual haulage systems, which have been designed and installed under my direction.

The following example will illustrate the method of using the curve: In a certain mine, it is desired to operate 5 six-ton locomotives for chamber work; 2 ten-ton locomotives for haulage work; and 100 hp. in pumps, which have to run during working hours.

The total weight of the locomotives will be 50 tons. From the curve is obtained the value 3.35 for the factor kilowatts per ton. Then the generator capacity necessary to operate the locomotives will be 50x3.35 kw. per ton= 167.5 kw. One hundred horse power equals 75 kw., for the pumps. As this last is a steady load it must be added to the 167.5 kw. required for the locomotives, making a total of 242.5 kw. The nearest standard size of generator is one having a rated capacity of 250 kw. and this will be large enough to operate the plant.

Some Labor Saving Devices for Handling Mine Cars

BY BENEDICT SHUBART*

About seven years ago, I was employed by the management of one of the large Western coal companies to visit their plants and make suggestions in regard to economies that might be effected around their tipples. At one of the tipples, the mine cars were let down an incline, and landed on a 1½ per cent. grade before being dumped. The cars were

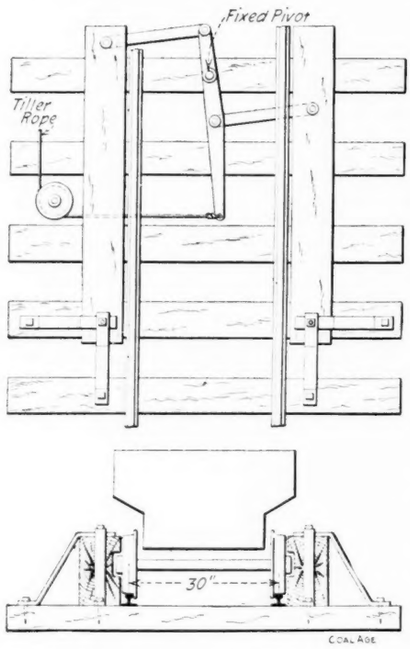


FIG. 1. CAR STOP MADE OF HEAVY TIMBERS

small, and were very uneven in their running qualities, so that a considerable amount of labor was necessary to handle the twelve hundred that were dumped each eight-hour day.

It occurred to me that a portion of the heavy grade of the incline could be utilized to feed the cars into the tipple. The suggestion was made that the tipple deck be raised so as to give about a 3½ per cent. grade, and a block of some sort provided to hold the cars back and feed them, one at a time, into the dump. W. J. Ellwood, superintendent of the mine, now superintendent at Sunnyside, for the Utah Fuel Co., made plans for and installed the block shown in Fig. 1. The results obtained in regard to increased efficiency and labor saving were so marked that I have since installed stops of this kind in a number of other tipples, with uniformly good results.

A SIMPLE, CHEAP AND EFFICIENT DEVICE

The device has the advantages of being simple, cheap and efficient, and is capable of standing an immense amount of abuse without being seriously damaged. It can be built by a blacksmith from material to be found about any mine. Fig. 1 shows a plan and elevation of the arrangement. The block consists of two timbers, approximately 10x16 in. in cross-section and 16 ft. long, the actual dimensions depending upon the size of the pit-car wheels, and the length of the cars. The timbers have a slot cut along one side to permit the hub of the wheel to pass. Both timbers are anchored at one end by a strong pivot bolt, and the other end is moved in or out by a series of levers and links. These are operated, through a rope connection, by a hand lever placed at a point close to the dump.

The end at which the pit cars enter is made slightly wider than necessary to admit the car wheels; and the other end is drawn up tight so that the car cannot pass through until the lever is thrown over. The small angle between the two timbers permits the cars to enter and come to a stop without shock. The tipple grades must be heavy enough to insure that the rest of the trip will follow by gravity.

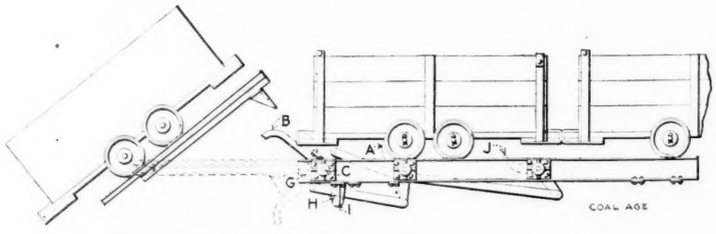


FIG. 2. CAR STOP AND FEEDER, OPERATED BY DUMP

When a trip is landed in the block, the topman immediately uncouples all the cars and then goes over to the empty track, having nothing further to do except make up the empty trip. When the man at the dump is ready to receive a car, he opens the lever, permits one car to come through and immediately closes the block, so as to hold the balance of

*Engineer, Denver, Colo.

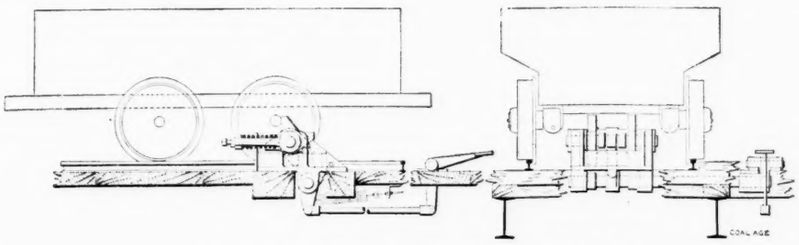


FIG. 3. CAR STOP CONTROLLED BY FOOT LEVER

the trip. The cars, being on a fairly heavy grade, start promptly, and neither time nor labor is wasted in getting a second car to the dump. The cost of the block, completely installed, should not exceed fifty dollars.

A STOP AND FEEDER AUTOMATICALLY OPERATED BY THE DUMP

Another arrangement for accomplishing the same result is shown in Fig. 2. It consists in part of two sets of horns, similar to the horns of a cross-over dump. The mechanism is carried on a steel frame. When the car, shown by the figure in the dumping position, is returned to the level, it strikes the lever *B*, opens the horns *A* and closes the horns *J*, so that car No. 1 passes on to the dump while car No. 2 is held by the horns *J*. When the car is dumped, the horns *A* are closed and the horns *J* are opened, thus permitting the trip to advance half a car length. The entire framework is mounted on springs, and inasmuch as the cars advance only half a car length at a time, the shock on the block and on the cars is not destructive. The cost of this block is $250, f.o.b. factory. It is known as the Reed Stop, and is made in Denver.

Fig. 3 shows a design of stop made by the Link-Belt Co. It consists of a rotating starwheel, which catches the axles of the cars. It is controlled by a lever near the dump, and holds the entire trip back, feeding the cars out one at a time, just as in the case of the other blocks. This also is mounted on heavy steel springs. Its cost is $100, f.o.b. Chicago.

COMBINED TRACK BRAKE AND CAR HAUL

Another method in common use in the West is to use a level car haul, as shown in Fig. 4. This is generally driven by a motor with a friction clutch cutoff. The cars are landed on a grade heavy enough to start the entire trip, and are held over the car haul by a track brake like that shown in Fig. 5. When the dump operator is ready for a car, he throws in the clutch and the car haul pushes a car through the track brake onto the dump. This is a very satisfactory arrangement, but its cost of installation is comparatively high.

Another block which can be used for small cars and light trips is a modification of the track brake, as shown on Fig. 5. This can be so arranged that the bars which bear on the flanges of the wheels can be drawn back, permitting the car to go through the block.

No matter which of these devices may be selected, any one of them will effect a decided saving in labor over the methods ordinarily used on tipples. Two men, or at most two men and a boy, can easily uncouple, dump and couple up the empties on a tipple handling 1200 cars every eight hours.

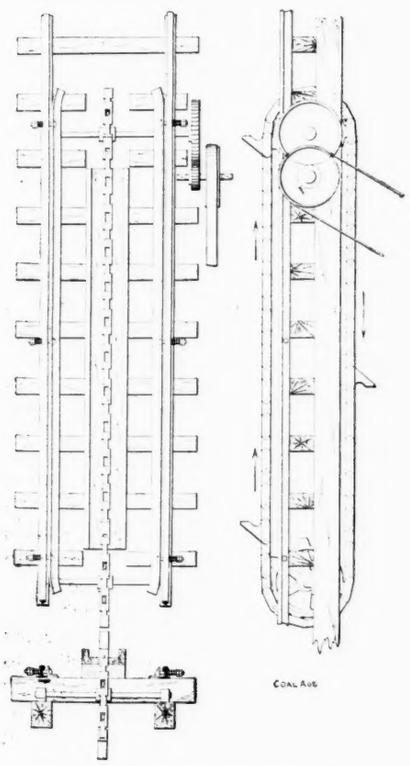


FIG. 4. TRACK BRAKE AND FEEDER

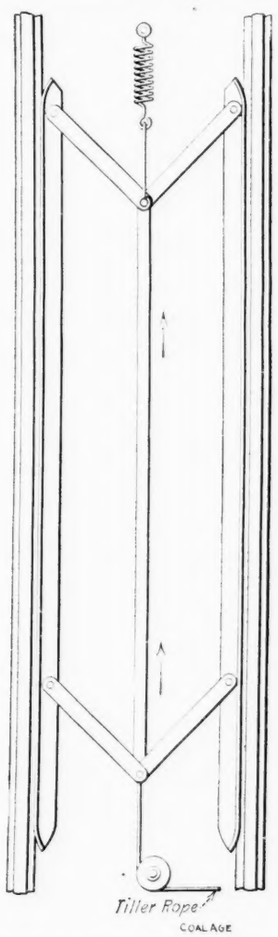


FIG. 5. TRACK BRAKE WITH RELEASING ARRANGEMENT

Alabama Coal Operators' Association

The annual outing of the Alabama Coal Operators' Association, held Wednesday, June 12, at the Docena mine of the Tennessee Coal, Iron & R. R. Co., was a great success, with a large attendance by members of the association, superintendents, foremen, state mine officials, and others. A barbecue was held on the ground, and a number of interesting papers were presented by well known authorities. The main thoughts emphasized at the meeting were mine sanitation and social betterment for mining camps. The program presented was as follows:

Morning Session — Introductory remarks by John H. Bankhead, Jr., of the Bankhead Coal Co. "Mine Sanitation," by Dr. S. C. Hotchkiss, U. S. Public Health and Marine Hospital Service. "Permanent Effect of Typhoid and Malaria on the Human System," by Dr. Robt. Nelson, City Health Officer, Birmingham, Ala. "Relation of the Employee to Sanitary Improvement" by Morris Knowles, civil engineer for the Ala. Coal Operators' Association. "Importance of Recreation for Employees," Marion Whidden. "Value of Improved Sanitary Conditions in Mining Camps," Benjamin F. Roden, president Roden Coal Co. General discussion. Dinner.

Afternoon Session—"The Fire Waste in Mine and Village," by H. M. Wilson, U. S. Bureau of Mines. "European Mine Practices in Contrast with Mining Practice in the Southern States," by Erskine Ramsay, vice-president Pratt Consolidated Coal Co. "Model Mine Track," by J. B. McIntyre, Birmingham Southern R.R. General discussion. Examination of exhibits.

Notes on Mining in India

Special Correspondence

The dips are heavy and thick seams predominate. The employment of women as miners is still in vogue, 35 per cent. of the underground employees being adult females. The death rate per 1000 employees is from one-fourth to one-half that for the United States.

From the report of G. F. Adams, chief inspector of mines in India, for the year 1910, it appears that the output of coal amounts to 11,387,716 tons, an increase on the preceding year of 93,489 tons, or 0.83 per cent. The bulk of the coal—10,777,306 tons, or nearly 95 per cent.—was raised in the province of Bengal. It is explained that the coal trade during 1910 was still "in the trough of the wave," but owing to the closing down of unprofitable mines there was not such a large accummulation of stocks as in the preceding year, and the trade was brought more into line with the change from the abnormal conditions existing in 1908.

There were 443 coal mines at work compared with 511 in 1909, employing 105,285 persons, a decrease of 4006. It is interesting to note that of the 67,425 underground workers 23,654 were adult females and 589 were children under 12 years of age. On the surface 37,860 persons were employed, and of these 11,212 were adult females, while 1499 were children under 12 years of age.

Accident Statistics

The deaths in coal mines from accidents numbered 160, and as the product per person engaged amounts to 108 tons only per annum, the death rate per million tons raised was 14.05, the average of the three preceding years being 10.98. Per thousand persons employed, the death rate was 1.52 as against 1.02 in 1909, which is from one-fourth to one-half that of the United States. In many cases the accidents were due to want of supervision, not so much to personal supervision by the manager as that likely to be afforded by an adequate and efficient staff of subordinate officials. The law requires that every part of a mine where persons have to work or pass must be examined by a competent inspector once in every 24 hours, but such an inspection by one having a large territory to cover is of doubtful value, and it is certainly not sufficient for the prevention of accidents arising from the vagaries of the Indian miner, which Mr. Adams says is a much more common cause.

The almost universally prevalent idea has been that Bengal coal mines are immune from explosions of firedamp except on a minute scale. This idea, however, must now be definitely abandoned in view of the explosion which destroyed 11 lives—and might very easily have been much more serious—at the Equitable Coal Company's Dishargarh shafts Nos. 1 and 3. Mr. Adams passes in review the circumstances and condition of the mine previous to the occurrence of the explosion and in his general remarks says:

"There are few accidents in mines which do not inculcate useful lessons, and it is to be hoped that managers will realize from this fatality the risk run by leaving a volume of gas standing for several days, with a chance of its coming in contact with a naked light, should any derangement of the ventilation or increased feed cause it to move out into the air current. There is risk even with the exclusive use of safety lamps. The safety lamp is the most perfect instrument at present at our disposal as a practical safeguard against explosions of firedamp in mines, but the human element enters largely into its comparative safety both as regards the putting of it together after cleaning and the use of it underground. An Indian miner may not understand that the breaking of a lamp glass or the propping open of a ventilation door or sheet may have the most serious consequences, and hence the exercise of vigilance and the taking of every precaution are all the more necessary in this country. Apart from all other steps which might have been taken, it is probable that if an inspection of the seam workings had been made by a subordinate official early in the evening on which the explosion occurred it could have been averted.

Some Typical Accidents

At the Assam Railways and Trading Company's Namdang coal mine, an accident occurred which consisted of a series of four explosions over a period of ten hours from fire in the old workings. At the second, five persons and, at the fourth, nine persons received injuries causing death. This mine is worked on the principle of driving main ways for a certain distance and then working the coal back in a series of chambers. As soon as a chamber is finished it is sealed off, the live workings being separated from the old or "deads" in which firedamp is always more or less present. The coal horizon is here 106 ft. thick and the principal seams are the top coal (27 ft. thick), middle coal (16 ft. thick) and bottom coal (32 ft. thick). There are three districts in the mine, and the accident occurred in the bottom coal-seam in No. 1 district, which is the district outbye of the other two. The measures dip at an angle of 56 deg. and in such a direction that all roads in a north-west and south-east direction are highly inclined, and the roads at right angles to them are practically level.

No less than twelve persons were killed at the Bengal Coal Company's Sitalpur coal mine by a fall of roof, the circumstances of which were of a very unusual character. Pillars were being drawn in the Dishargarh seam, which is here 20 ft. thick and lies at a depth of 300 ft. Immediately above the coal is a band of shaly sandstone 4 ft. thick, and above this is coarse-grained, hard, massive sandstone up to the surface. Owing to the tender nature of the former, about 5 ft. of coal is left under it as a precautionary support wherever the seam is mined. In goafing operations it is found that the shaly sandstone, with its coal support, falls almost immediately after the withdrawal of the timber; it may hold for a few hours, but the delay never exceeds two hours, according to a statement made by the manager. It appears, therefore, that this roof is supported more or less by timber during the period of goafing. With the hard sandstone or main roof this is not the

STATISTICS RELATIVE TO COAL MINING IN INDIA

Year	Amount of Coal Raised	Average No. of Persons Employed	Total No. Deaths	Death Rates	
				Per Million Tons Raised	Per 1000 Persons Employed
1901	6,251,522	85,361	58	9.28	0.67
1902	6,790,507	89,503	59	8.69	0.66
1903	6,812,725	79,561	67	9.83	0.84
1904	7,561,338	82,002	55	7.27	0.67
1905	7,770,471	79,506	58	7.46	0.72
1906	9,112,663	90,159	80	8.78	0.89
1907	10,526,468	102,689	89	8.45	0.86
1908	12,149,020	120,107	164	13.49	1.36
1909	11,294,227	102,291	119	10.53	1.08
1910	11,387,716	105,285	160	14.05	1.52

case. Large areas of coal may be extracted before its condition is affected.

Pillar Robbing Caused Accident

Goafing, or pillar drawing, had been going on for 18 months and an area of 17 beeghas[1] had been goafed. The massive sandstone had not fallen in any part of this area, but the roof coal and shaly sandstone had fallen almost completely. It was the sudden collapse of this lower roof over a small area that caused the accident.

The timber was drawn off around a stock of coal, though with difficulty, owing to the props having taken considerable weight, and immediately afterward the roof came in. The amount of coal to be recovered did not exceed 25 or 30 cars (about 15 tons) but this the manager decided to secure, and accordingly he issued orders for the area to be retimbered. Propping was commenced and when the place had been retimbered about 24 miners started loading the coal under the supervision of a sirdar. The roof suddenly fell, without warning, killing the sirdar and 11 miners and injuring two others. The fall extinguished all the lights and caused eight props to be dislodged by falling coal and stone.

This wholesale sacrifice of human life, Mr. Adams adds, arose out of a desire to get 15 tons of coal quickly, regardless of the obvious danger incurred. Not only were the miners permitted to work in a goaf at night (a practice hitherto prohibited), but they were allowed in an area from which the timber had once been withdrawn. The resetting of the timber must have been carried on under conditions of danger, and this course of action was pursued in spite of the experience possessed by the manager of the treacherous nature of the roof, for he says, "it follows the withdrawal of the timber almost immediately, within an hour or so, and at the most never hangs more than two hours."

"East is east and west is west" is a saying commonly used to cover up the strange things that happen in India, and as an explanation of the curious customs of the Oriental. Nevertheless, it is hard to realize that last year 23,654 adult females and 589 children under 12 years of ago found employment *within* the mines, and under the circumstances it may not be surprising that the coal product per person was only 108 tons. The accompanying table shows the amount of coal raised in tons, the number of persons employed and the death rate in respect to coal mines under the Indian Mines Act during the last decade.

[1]The Indian beegha varies in different provinces (and even with different dynasties) from one-third to two-thirds of an acre.

Boiler Feed Water

It is to be hoped that the few coal-mining plants which have an adequate and reliable supply of good feed water for their boilers fully appreciate how fortunate they are. The reverse condition usually exists. A large proportion of coal-mining operations are located in mountainous or hilly countries, where deep short valleys are the rule and the available supply of water is apt to alternate between periods of freshet and drought. Moreover these mines are more or less compelled to use the natural waterways as an outlet for their mine water, with the result that plants located farther down stream find their most easily available supply contaminated by water from the mines.

Resort is often had to well waters, but unless a supply can be obtained from above the coal, or a considerable distance below the coal, and the latter carefully cased off, these waters are apt to show a contamination due to iron and sulphur leached out from the coal. Even those who do not appreciate the full effects of unsuitable feed water upon a boiler plant, very seldom go so far as to suggest the use of mine water for this purpose except in cases of great emergency.

The result is that frequently, resort must be had to various devices for obtaining a proper supply. Operations having an available supply of good water at certain times during the year build reservoirs to provide for periods of protracted drought. Others find it necessary to haul or pump their water from a distance, and still others make shift to use almost any water that comes to hand by purification of the supply.

Impurities from Mine Water

The impurities of water which chiefly concern the colliery boiler plant are those arising from contamination with mine water. These are usually present in the form of sulphates of iron, aluminum, lime and magnesia; also, as given by a number of analyses, a certain percentage of free sulphuric acid. The first two sulphates are quite as active and destructive as the acid itself, inasmuch as they are disassociated by heat, the acid element set free and the iron and alumina precipitated as scale or sludge. Sulphuric acid is non-volatile and it readily accumulates in the boilers, both that introduced as acid and that formed by the breaking down of the sulphates above mentioned.

The presence of the sulphates of lime and magnesia in the water is largely due to the effect of the acid from the mine water upon the carbonates of lime and magnesia originally present in the soil or water. These sulphates produce a hard scale in the boilers, especially that of lime which acts as a cement for the other precipitated substances.

Most mine owners and managers are aware of the evil effect of sulphuric acid and active sulphates upon their boilers, but it may be questioned if they all fully recognize just how much of their operating expenses are chargeable to poor water supply. Many scales only ¼ of an inch thick offer so much resistance to the passage of heat that the heating surfaces must be brought to a temperature of 700 or 800 deg. F., in order to raise the water to 331 deg. which corresponds with a steam pressure of 90 lb. Ordinarily, with a clean shell, 335 deg. on the external surface, is sufficient to accomplish this. Corrosion and scale cause increased expense along a number of lines such as repairs to boilers, tubes and pipe lines; labor expense for cleaning boilers and heaters; waste of fuel; purchase of inadequate compounds and other makeshifts; but, above all, loss in production due to shutdowns for repairs and cleaning or else a great increase of fixed charges in order to duplicate parts of the plant in an effort to avoid shutting down.

Necessity for Forethought

Generally speaking, a supply of water for the boiler plant should be given more consideration at the time of establishing a new colliery, instead of being looked after in more or less haphazard fashion after the plant is well underway. Reservoirs are usually an expensive proposition, often prohibitively so to small concerns. Well water is not always a possibility, and systems of purification to be of value should be carefully planned, installed and operated.

In regard to the latter, it may be said that the boiler and the feed water heater are not the best places for purification. The reagents used for purifying should be carefully proportioned to the water, given time for action and sedimentation, and the precipitated matter properly filtered off. Heat in connection with this work brings about reactions and concentration which are not definitely known or discoverable and may be productive of uncertain results.

When compounds are introduced into the boiler or heater, removal of the sediment must be accomplished by the boiler blow-off, which is of little value except in the immediate locality of this outlet, or by the frequent removal and cleaning of the heater trays. On the whole, it would seem that the best place to treat feed water is in storage tanks or reservoirs provided for this purpose, and the only basis on which to attempt anything of the kind should involve the employment of an intelligent person for determining the varying proportion of impurities in the water and introducing the softening and purifying reagents in correct quantities. Recent developments have rendered this task comparatively simple.

Who's Who—in Coal Mining

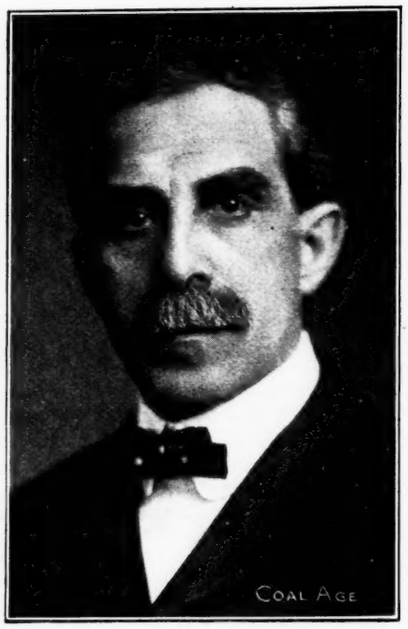
Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

[The following sketch of Capt. W. A. May is published without his consent or knowledge. Our personal request for data met with refusal, on the ground that he did not relish publicity. We are printing a weekly paper for the industry as a whole, and any line of work we start must be done with all the completeness possible. To omit a sketch of one prominent man, even at his own request, would be unfair to our readers and without credit to ourselves. We have so far had the cooperation of all those to whom the compliment has been paid, and to all others who may object, this is not a threat, only an honest promise.—EDITOR.]

The management of big coal mines requires men of deep thinking who can put into practice what has come to them in a theoretical way. Splendid opportunities are presented to evolve new theories, and consequently new practices. The general supervision of several thousand men, and the responsibility for the proper solution of big mine problems, call for unusual tact and disciplinary measures. The coal-mine manager is not alone responsible for the future of his plant, but it is solely up to him to prepare the plans of attack and defense, in the matter of economy at least.

Theoretically speaking, there is much in common with the management of an army of workmen, and the generalship of an army of soldiers. It does not follow as a general rule that the coal-mine manager would make an excellent army officer, or that the army officer would make the most successful mine general. But it is strikingly true in the history of the anthracite fields that where there is a combination of each in the same man, the army without exception has a splendid officer, and the coal mine in return gets the services of a man who understands the laws of strategy and economy, as well as the benefits of waging the battle at the most opportune time.

The hard-coal fields have many mining men who are good soldiers. The pages of the Keystone state's history contain the names of a number of prominent coal officials who have been identified successfully with the military movement, especially the National Guard. The anthracite territory offers no better illustration of this combination than the life of Capt. W. A. May, of Scranton, who, by the way, has done as much, and more than most men, in putting Scranton on the map.



W. A. MAY

Capt. May is a civil engineer of high accomplishments, and this, no doubt, accounts for his success in mining and military life. He comes of sturdy stock, being the son of Rev. Lewis May, who was a native of Germany. "W. A." was one of four sons, and attended schools at various places in which his father's ministerial life was passed. When 14 years of age, he was left fatherless, and then began the real active preparation for his future. Solely through his own efforts has his life been a success, and if there be such a thing as a self-made man, Capt. May is a shining example.

He possessed the means of entering Dickinson Seminary after his mother's death, and there he won the degree of Bachelor of Arts. While a seminary student he had made a special study of civil and mining engineering, and his ability was so well known that he was appointed chief of the engineering department of the Hillside Company. Subsequently, he gave up his position to better prepare himself, and entered Lafayette College, Easton, Penn., from which he graduated in 1876, with the degree of civil engineer. Later he received the degree of Master of Arts from the same institution.

Following his college career, W. A. May resumed his position with the Hillside Coal & Iron Co., and two years later added to his duties in that capacity the more responsible place of chief engineer for the Northwestern Mining and Exchange Co., in Elk County, Penn. Shortly after this he was also placed in charge of the civil engineering work for the Meredith Coal Co. and the Gaines Coal & Coke Co. in Tioga County. These multifarious duties were creditably discharged until 1883, when he accepted the position of superintendent of the Hillside Coal & Iron Co., and served in that capacity until 1901, when he was made general manager of the Pennsylvania Coal Co. and the New York Susquehanna & Western Coal Co. He is now in charge of these interests.

Capt. May is responsible for the mining of 30,000 acres of coal lands. Twenty-four collieries are directly under his charge, and the annual output of these mines is estimated at 5,000,000 tons. In addition, his companies handle 1,500,000 tons of coal purchased under contract. He has under his direction a total of 14,000 workmen.

For the handling of this army, Capt. May received a training in the National Guard of his state. For 10 years he was a member of the state militia, and today he proudly shows a marksmanship medal commemorating that period of service. He enlisted first as private in the Thirteenth regiment, February, 1878, and was mustered out in November, 1888, as captain of Company D. During his service in the Guard he was an earnest student of military affairs.

While the weighty responsibilities of his present position would seemingly tax the energies and endurance of any one man, Capt. May is actively identified with various other large interests, being secretary and treasurer of the Walburn Land Co. and secretary of the Schuylkill Anthracite Coal Royalty Co. He has made it a point to take a prominent and useful part in the general affairs of the community, and particularly in connection with the Scranton Board of Trade, where he showed so much ability that he was retained in the presidency for five successive terms from 1893 to 1897, inclusive.

In was in his first presidency that the work of putting Scranton on the map was begun. The board was aroused from its lethargy following the disastrous financial panic of 1893, when many of the industries were languishing and were in need of stimulation. Under his leadership the work of the Board of Trade in this period

stands out as the most important epoch of its history.

W. A. May headed a band of canvassers, who went from house to house and raised the money for the building of the Board of Trade home. It was a hard uphill fight, but the movement was crowned with success. This was not the only thing he did for Scranton, for it was largely through his untiring efforts that the Thirteenth Regiment armory, the Y. M. C. A. building and the Elm Park Methodist church were built, and Scranton took stronger root from then on and has been growing ever since.

As a public servant Capt. May has served as a member of the Select Council and as a member of the Board of School Control. He is a prominent member of the American Society of Civil Engineers, the Scranton Engineers' Club, the Scranton Club, and the Westmoreland Club of Wilkes-Barre. He is held in honor as one of Scranton's foremost citizens in point of public spirit and the city has much good to credit to this undemonstrative but forceful leader.

Inability to Test for Gas

By James Ashworth*

Many men well fitted mentally to act as firebosses and shot firers are incapacitated by reason of defects in sight rendering it impossible for them to observe a cap. The cause of this defect is a matter of much dispute, but as the failing is proved to be prevalent, the eyesight of all who have to recognize the presence of gas should be tested.

*Vancouver, B. C.

Many years ago, in the early experiences of my mining life, I had charge of a colliery, where, through the stoppage of some large pumping engines which were removing surface water from an easy depth, the mines of a whole district were flooded. This disastrous flooding was due to the cutting of cross-measure tunnels, so as to bring the output of several mines to one shaft bottom. The inability of the local operators to come to any equitable agreement, providing a comprehensive scheme to deal with the impending disaster, made flooding inevitable. Thus the district was flooded with water and remains under water to this day.

How a Miner Prevented a Disaster

At the colliery to which I refer, three seams of coal were being worked, one at 360 ft. deep, the second at 720 ft. and the deepest at 900 ft. The influx of water came into this colliery through the middle seam from some old workings on the lower side, and although it overflowed into the deeper mine and gradually rose, yet for some time it was hoisted out of the mine in a large tank. At this point there was an opening between the downcast and upcast shafts through which a current of air was maintained to keep the shafts clear from firedamp.

One night, the constant disturbance of the water, due to the dipping of the tank, caused the roof to fall, or some material to wash into this connecting air passage between the shafts, blocking it up. Unknown to the men in the top mine, firedamp commenced to accumulate in the downcast shaft and eventually passed with the intake air into that level. The top mine was worked with open lights, but, in accordance with the Act of Parliament, the mine was examined with a Davy lamp (an unbonneted gauze safety lamp). The miners traveling to their work along the return airway met the fireboss at the "station," and he reported that every place was safe.

One of the miners, however, who was more observant than his fellows, and who later on was the compiler of a well known book for the special use of men wishing to obtain mine officials' certificates, perceiving that the flame of his candle was spiring upward with a long, smoky flame, and realizing that something serious was amiss, took the law into his own hands and ordered all open lights to be extinguished. His promptness of action doubtless saved the lives of the whole company, for all reached the surface in safety.

The Defective Eyesight of the Fireboss

A careful examination was then made with safety lamps, to ascertain from whence the gas originated, and as before stated, it was found to be in the downcast shaft. This, however, is not the point to which I desire to direct attention, but to the fact that it led up to the discovery that the fireboss' eyes were defective, and that although a miner or fireboss with ordinarily good eyes could see a large firedamp cap in the Davy lamp, the fireboss in question could not see it at all.

This practical demonstration of deficient eyesight has caused me ever since this close approach to a serious disaster, to call frequent attention to the importance of examining the eyes of every fireboss, to ascertain with absolute certainty whether or not he can detect the presence of 2½ to 3 per cent. of firedamp when mixed with air. Often have I been told that the idea is preposterous, though once in my experience one of my friends was interested in my suggestion to such an extent that he had the eyesight of his officials tested by placing the safety lamp they commonly used, viz., a bonneted Clanny, in measured mixtures of methane and air. Although this examination did not expose any bad case of deficient eyesight, yet it did demonstrate that the vision of all men was not equally good.

The importance of an examination of this kind is especially necessary where firebosses have to act as shotfirers, and where special shotfirers have to make examinations for firedamp before applying an electric battery or lighting a fuse.

Jed and Merritt

Today the danger arising from low percentages of firedamp when mixed with the normal quantity of coal dust which is always found in the rooms of mines during a working shift, is almost universally recognized, but if it is not, then the recent disaster at the Jed Colliery, in March last, is sufficient justification for calling the most serious attention to the subject. There was no evidence given at the Jed inquiry, so far as I know, which would suggest that the fireboss who ignited the fatal blast had deficient eyesight, but it is only charitable to suppose that when he made his examination for firedamp before firing the shot, he did not discover a sufficient cap to indicate any such dangerous conditions as would tend to imperil either his own life or that of every other man in the mine. Likewise, in the case of that other disaster at the Merritt colliery (B. C.), which preceded the Jed disaster, the miner who examined the air in his chute with a Wolf safety lamp might not have seen the real size of his gas cap. For this reason he may have decided to hang up his safety lamp and go to work with an open light.

For a considerable number of years it has been well known to medical men who have specialized in diseases of the eyes, that nystagmus and photophobia are two affections of the orbit which are common among coal miners, but until quite recently no government officials have given the matter any attention whatever. At the present time this important subject has begun to receive the serious attention it deserves from British and some other mine authorities.

Snell-Court Controversy

Probably the first public attention which was directed to this subject arose out of a wordy war between two eminent doctors, who lived within 50 miles of one another, and who had unique oppor-

tunities of making a practical study of the question among the miners, who, in their districts, worked by the light of safety lamps, principally of the bonneted or shielded Clanny or Marsaut patterns. One of these two eminent doctors, Dr. Snell, of Sheffield, now deceased, diagnosed from his experience that the diseases of nystagmus and photophobia were caused by the position of the miner when lying on his side and holing under the coal, and the other, Dr. Court, of Staveley, concluded that they were due to the imperfect light in which the miner worked. The miner's safety lamp did not give an illumination equal to that of a candle, which he formerly used.

The contention between these savants continued for some time, and then did not quite die out, but became quiescent.

While the matter was still "hot" I, who knew and visited them both, demonstrated to them that it was quite possible to remove the causes they had given for the occurrence of the disease. I showed Dr. Court that a safety lamp could give a light equal to one and a quarter standard wax candles, which means that the illumination could be increased 50 per cent. above that of the lamps ordinarily used without in any way decreasing the safety value of the lamp.

Reflector to Prevent Nystagmus

I also demonstrated to both of them that a glass I had designed, patented and had caused to be constructed with one-third of the vertical side made into a reflector, and shade for the eyes, by the aid of white enamel, would not only shade the miner's eyes from the "glare" of the polished glass but would increase the strength of the light on the miner's work. At first this special glass was rather expensive to manufacture and this was unfortunately some hindrance to its sale, but it is still extensively used by officials.

The same patent covered another form of enameled glass, viz., one having a dull black surface, and this is today the very best background for a testing flame, when making examinations for low percentages of firedamp. It is ordinarily used in the Ashworth-Clowes hydrogen gas-testing safety lamp, the use of which for certain tests is compulsory in the mines of New South Wales.

The public interest in the subject of officials' eyesight died down for a considerable time, though occasionally I referred to the subject. Some years later the present Royal Commission on Mines in Great Britain, which has for a long time been taking evidence on the subject of mine accidents, appointed a subcommission, consisting of Dr. Haldane as director (also a member of the commission), and Messrs. Cadman and Whalley (two inspectors of mines), to report specially on ventilation to determine at what point the firedamp content became dangerous, and also to inquire into the eyesight of mine officials. The results of these investigations have been published in a separate volume, and will be found of the deepest interest to any student of these matters.

So far as the subject of the present article is concerned the fact was most clearly established that there were quite a number of officials making daily examinations of mines who could not detect 3 per cent. of firedamp when it was present in the ventilating air current. It was thus proved abundantly that all such men might fire shots in a mine under the most dangerous conditions, and yet be entirely oblivious of the risk they were taking. I am even more firmly convinced than I ever was, that the subject of eyesight ought to receive the most serious attention from every government. The test should not only apply to officials but the miners themselves should be examined. The need for examining the latter was proved at Merritt.

The Disease and Its Cure

Men suffering from the most common eye troubles often see two or more flames in their safety lamps, or perhaps the flame dances or rolls. Some miners with defective eyes may be readily detected by the way they walk with their heads thrown back, and these men sometimes obtain nicknames, such as "peep up." It appears to be proved almost to a certainty that miners working in open-light mines do not suffer from nystagmus, and therefore the best practical cure is to remove a man to an open-light mine when suffering from an eye disease.

I am strongly of the opinion that the use of either a white enamel reflector on the glass of his safety lamp, or some other form of protection which softens the light and shuts out the glare from the polished glass, will prove to be an effective protection for the miner against nystagmus and photophobia. This, however, can only be looked upon as an amelioration, and could not render a man competent to act as a fireboss, or a shotfirer or even as a miner where the miners are allowed to fire their own shots.

Anent the question of high illuminative value from a safety lamp flame, it is the opinion of many men that a large flame makes a safety lamp unsafe, but as a matter of fact, if the lamp is constructed on the best possible lines, a large strong flame is safer than a small one. A lamp with the air inlet below the flame will always give the best illumination no matter what illuminant is used, and if the inlet and outlet air openings are regulated so that the upper gauze cannot become filled with an explosive mixture, then there is every possibility of increasing the illuminative value of a safety lamp and thus providing the main "cure" reccommended by the eye doctors.

The number of safety lamps in use in coal mines must of necessity increase as mines become deeper and therefore it needs no apology on my part for the length of this contribution, which, considering the number of men and mines the safety of which is in question, really deserves much more detailed treatment.

Kentucky Mining Institute

More than fifty mine operators, superintendents, inspectors and others attended the meeting of the Kentucky Mining Institute, in Lexington, June 10-11. C. J. Norwood, state inspector of mines, presided at the opening session, and Henry S. Barker, of the State University, delivered an address of welcome, which was responded to by J. E. Butler, superintendent of the Stearns Coal Company.

Mr. Norwood delivered a talk on the prevention of accidents, following which a visit was made to the U. S. rescue car, which had been brought from Knoxville to Lexington for the purpose. Among the addresses delivered was one by C. A. Bray, of the General Electric Co., on "Mine Haulage." R. G. Stevens, of the Clinchfield Coal Corporation, spoke on "Hydraulic Cartridges versus Powder," and James L. Bowen, Jr., of the American-La France Fire Engine Co., spoke on "Fire Prevention." E. B. Sutton, of the U. S. Bureau of Mines, gave a talk on mine-rescue work.

Election of officers for the ensuing year resulted in the choice of Frank D. Rash, as president; T. J. Barr, secretary; and M. L. Conley, treasurer. The next semi-annual meeting of the association will be held in December. The place of meeting was not decided.

Expropriation of Mines

For the purpose of reducing the high cost of living, it has been proposed to nationalize the coal mines in Austria. A commission, appointed to study this question, has reported unfavorably, according to the *Echo des Mines et de la Métallurgie*, Paris. Section Chief Hohmann, representing the government, states that nationalization would require so large a sum of money that the government cannot undertake it. He thinks further that it is wrong to expect great results from nationalization, which would have all the defects and inconveniences of every monopoly. He is convinced that the only thing to do is to encourage competition in the sale of coal.

Last Week's Front Cover

The two photographs on the front cover of Coal Age last week were supplied us by C. E. Tobey, superintendent of the Delaware, Lackawanna & Western R.R. Co.'s coal-mining department. The views were copies of photographs that appeared in the excellent book, "Mine Accidents and Their Prevention," which was prepared for use in the instruction of the mine workers of the D. L. & W. R.R. Co.

Gasoline Motors in Coal Mines

By A. J. King*

The gasoline motor is not a new introduction. It effects economy by making a power plant unnecessary and there is no risk of death from contact with wiring as with electric motors. The formation of carbon monoxide and the danger of premature explosion of gasoline are important objections. Where used, an increase of ventilating current is recommended.

*Mining engineer, Charleston, W. Va.

Note—Abstract of a paper read before the West Virginia Coal Mining Institute, June 6, 1912, at Charleston, W. Va.

For possibly thirty years gasoline motors have been used for various purposes on the Pacific Coast and in the metal mines of the West, this development being brought about by the high costs of steam generation and in many cases by the scarcity of water in arid regions.

Stationary gasoline motors were first used in the mines of this state about 15 years ago, and at about the same time the Prouty Company, of Chicago was advertising its manufacture of gasoline haulage motors of different capacities for mine work. It has been since the advent of the automobile and during the past six years that manufacturers have seriously tried to develop a gasoline mine-haulage motor which would satisfactorily meet mining conditions; and I am now given to understand that there are about three hundred in actual service.

Description

In shape and appearance the gasoline locomotive closely resembles the electric motor, except that it has no trolley pole. The larger types of the gasoline locomotive require more height than an electric motor of the same weight. The cylinders, or combustion chambers, are water-jacketed to prevent undue heating and consequent sticking or binding of the piston. Excessive cooling of the cylinders, however, reduces the efficiency.

Rotation is always in one direction, so that the reversing is done by means of clutches and miter gears. They are usually constructed so as to run on full and on half-speed. Each motor is equipped with what is called a carburetor. Its office is to mix the air and gasoline properly in the cylinder. They are also equipped with an electric igniting device, which is so connected as to operate from a storage battery when the motor is starting, and thereafter from a magneto.

Absorption of Carbonic Dioxide

Some manufacturers also equip the motor with absorption chambers, the types and capacities of which differ with the size of the motor. These absorption chambers are intended to absorb the carbon dioxide generated, and to cool the gases emitted. It is also claimed that these prevent ignitions of firedamp or coal dust in case the engine "back-fires."

The gasoline storage tanks are placed, in some makes, in the side of the motor frame, while in other types it is suspended within the frame, or is placed in a more or less exposed position. The repairs are said to cost about the same as for electric motors of the same power, but on account of the gasoline motor having reciprocating parts, the writer is inclined to believe that they cost more.

Advantages

The advantages of the gasoline motor are as follows:

First. No power plant is needed to operate it, the power generating apparatus being a part of the motor. This saves the fuel, labor and maintenance charges of a power plant.

Second. Transmission wire lines or pipe lines are not needed, and line losses and line maintenance are dispensed with.

Third. The motor is not affected or interrupted by short circuits, broken pipe lines or by drains upon the transmission lines by other motors.

Fourth. No trolley lines, hangers, bonds or cables are required; thus the labor for their installation, their cost and maintenance are saved.

Fifth. The motor aids in the humidification of the mine air.

Sixth. It is safer than a trolley wire equipment in that the mine employes are less liable to meet with injury through contact with the motor or its transmission lines.

Seventh. No time is lost in handling the trolley pole or wires; and in gathering it is unnecessary to attach and detach either transmission or haulage cables.

Disadvantages

The disadvantages of the gasoline motor are:

First. The use of gasoline in the mines is dangerous because it readily volatilizes, and when mixed with air forms a very explosive gas.

Second. The combustion of gasoline in the combustion chamber extracts oxygen from the mine air.

Third. Carbon dioxide and free nitrogen remain after the perfect combustion of the gasoline.

Fourth. The carburetor is usually adjusted to furnish as nearly as possible the proper mixture of gasoline vapor and air when the motor is doing its heaviest work, so that if we assume that under these conditions we get perfect combustion, it is evident that when the engine is running with the locomotive standing, or when the motor is doing light work, we must get a more or less imperfect combustion, and this results in carbon monoxide being given off.

Fifth. The absorption chambers do not eliminate all of the carbon dioxide which is produced, nor do they prevent the carbon monoxide or free nitrogen from being discharged in the exhaust. At least this is my opinion.

Sixth. When the coal must be cut by mining machines, a power plant must be operated and maintained and transmission-lines, both outside and inside the mines must be erected and kept in condition. This plant need not be so large, however, as if haulage and cutting services were demanded of it.

Seventh. The gasoline motor costs from 25 per cent. to 50 per cent. more than an electric motor of the same power.

Eighth. It is also said that, due to its having but two speeds the gasoline motor will not start as large a trip as the electric motor.

Ninth. It will not take an over-load, as does an electric motor according to some authorities, but it seems to me that the tractive effect in either case is dependent upon the weight of the motor, and, in the case of the gasoline locomotive the engines can be designed large enough to give the necessary torque.

Tenth. At the present time the gasoline motor cannot be safely used in a gaseous mine.

Chemistry of Combustion

Gasoline is of that hydro-carbon series, of which the typical formula is C_nH_{2n+2}. Assuming a specific gravity of 0.70 at 32 deg. F., its formula would approximately be C_7H_{16} which is called heptane. A gallon of this oil will weigh about 5.85 lb. Assuming that we get perfect combustion in the engine, we have the following chemical changes.

$$\underset{100}{C_7H_{16}} + \underset{352}{22O} = \underset{308}{7CO_2} + \underset{144}{8H_2O}$$

which means that for every 100 lb. of gasoline used 308 lb. of CO_2 are produced; that 352 lb. of oxygen are abstracted from the mine air, and that

1178.2 lb. of free nitrogen are the result (neglecting other constituents of mine air, and assuring that oxygen and nitrogen exist in the proportion of 23 and 77 per cent. respectively by weight).

Let us further assume that a five-ton gathering motor is used, and that the consumption of gasoline per day is 2½ gal. per ton weight of motor. This motor would then consume 12½ gal., or 73.1 lb. It would then produce 225 lb., or 1921 cu.ft. of CO_2, 861.4 lb., or 11,570 cu.ft. of nitrogen, and 105.26 lb. of H_2O. It would rob the mine air of 257.3 lb., or 3026 cu.ft. of oxygen.

There would, therefore, be produced, 1086 lb., or 13,491 cu.ft. per eight-hour day, 1686 cu.ft. per hour, or 28.1 cu.ft. of black-damp per minute. To keep the percentage of these gases below one, we would require a volume of 3000 cu.ft. of air passing per minute.

Increased Ventilation 1000 Cu.Ft. Per Ton

If however, we have incomplete combustion in the engine, carbon monoxide is produced, and the dangerous character of this gas, even one-tenth of one per cent. being injurious and poisonous if breathed for any length of time, makes it imperative that additional air be provided to make ventilation exceptionally good, and I would suggest that the quantity of air to be provided for the particular motor which we have under consideration be made 5000 cu.ft. per minute, say 1000 cu.ft. per ton of motor.

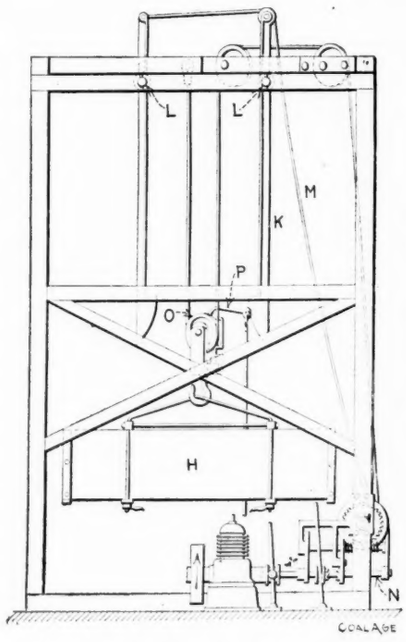
There are conditions in the mines under which the gasoline motor will operate satisfactorily, but its many advantages should not cause us to neglect or overlook the dangers incident to its use. When manufacturers practically eliminate any danger from carbon monoxide poisoning by building engines which will have perfect combustion under varying loads, and when the mine operator using them realizes that he must provide ample ventilation to carry away and dilute the noxious gases which they generate, we may then, with more assurance, say that the gasoline mine motor has come to stay.

Coal and Coke Patents

Coal Dumping Device

An improved arrangement for dumping a coal wagon into a bin or other depository is shown in the accompanying figure. It is easily operated and has the further advantage that the load can be dumped at any desired point.

Referring to the figure, the wagon body *H* is engaged by a rectangular frame suspended from a hoisting hook. Mounted upon the upper front cross beam are latch arms *K*, pivoted at *L*. The upper ends of the arms extend above the frame, and one has connected to it a cable *M*. By means of this cable, the arms can be made to catch one end of the wagon body when raised, so that the opposite end, when lowered, will discharge the load. For, on pulling the cable, the upper ends of the latch arms swing inward, thereby spreading the free ends of the arms and releasing the wagon; then by reversing the rotation of the shaft *N*, the hoisting cable may be unwound from the drum for lowering the wagon as desired.



Coal-dumping Device

Attention should be called to the pulley block from which the hoisting hook is suspended. While the pulley *O* is being rotated by the hoisting cable, the hook may be turned to either right or left by means of gears controlled by the arm *P*. Nels Peterson, Canton, S. D. 1,025,833. May 7, 1912.

Other Patents

Sidewalk Endless Ash Conveyor. A. Sundh, assignor to Otis Elevator Co., New York, N. Y. 1,025,168, May 7, 1912. Filed Aug. 16, 1907. Serial No. 388,814.

Coal and Slate Separator. J. T. Norman, assignor to Norman Picker Co., Nanticoke, Penn. 1,025,587, May 7, 1912. Filed Nov. 5, 1910. Serial No. 590,895.

Coke-discharging Apparatus. D. F. Lepley, Connellsville, Penn. 1,025,815, May 7, 1912. Filed May 28, 1909. Serial No. 498,870.

Coke Oven. R. S. Moss, Chicago, Ill. 1,025,419, May 7, 1912. Filed Feb. 7, 1911. Serial No. 607,148.

Storage of Coal. W. F. Hunt, assignor to C. W. Hunt & Co., West New Brighton, N. Y. 102,644, May 14, 1912. Filed July 25, 1911. Serial No. 640,524.

Conveyor Bucket. R. W. Dull, assignor to Stephens-Adamson Manufacturing Co., Aurora, Ill. 1,026,385, May 14, 1912. Filed Oct. 22, 1910. Serial No. 588,478.

Miner's Lamp. B. Blount, New York, N. Y. 1,026,622, May 14, 1912. Filed Aug. 26, 1911. Serial No. 646,268.

Mining Machine Bar. G. C. Arndt, Portland, Ore., and G. N. Jack, Willamina, Ore. 1,026,295, May 14, 1912. Filed Mar. 23, 1911. Serial No. 616,408.

An Unexpected Electrical Trouble at a Colliery

Special Correspondence

At a well arranged colliery installation where electricity is employed it is now customary to find that careful rules and regulations are laid down with regard to the periodical overhauling and inspection of the electrical equipment and this naturally has a considerable effect in reducing the number of breakdowns. These inspections are, however, necessarily of a routine nature, and occasionally something happens which shows that a lookout must always be maintained for trouble of a special and exceptional character.

As an example, one incident of unexpected trouble may be mentioned. In the course of running a coal cutter a breakdown occurred. This was duly reported and the matter investigated. The motor was tested, but it was not discovered what was wrong. The armature turned freely, and electrical tests seemed to show everything in good order, but as soon as the current was switched on, the armature jammed and the fuses on the circuit blew. The armature was therefore taken out and closely examined, but nothing was found amiss, and the affair became a considerable puzzle to the electrician.

Eventually, it was discovered that a wedge-shaped piece of metal had been broken out of the flanged end of the armature. As soon as current was switched on, a magnetic field was set up which influenced the fragment and caused it to be drawn in on its end, so that the point dug into the winding, causing a ground and blowing the fuses of the circuit. But as soon as the current was interrupted, the fragment, being of soft iron, fell flat again and was unnoticed when the armature was taken out for inspection.

This incident shows that in view of the severe conditions under which such machinery has to work, the inspection to which it is subjected should be of a thorough and searching character in order to eliminate if possible any defects which may be developing before they become a serious matter.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

The Other Side in the Price Controversy

We quote these editorials to exhibit how public opinion is being wrought up on the question of anthracite prices. We could hardly blame the public when it attempted to forestall an intention to raise prices unduly if such an intention existed. But a discussion prior to publication of schedules is apt to be unfair to the companies, and to create unreasonable prejudice. It is for that reason to be reprobated especially when such radical views as these from the New York papers are expressed.

"The Anthracite Trust and the Day of Wrath

The "Anthracite Octopus" is astir again, with its remorseless selfishness and its accustomed unity and vigor. Eight railroads constitute the Octopus—the Philadelphia & Reading, the Lehigh Valley, the Central of New Jersey, the Lackawanna, the New York, Susquehanna & Western, the Delaware & Hudson, the Pennsylvania, and the New York, Ontario & Western.

And these eight absolutely control the production and price of 85 per cent. of the coal of the entire anthracite region—a power which they exercise with unwavering arrogance and with ever-increasing extortion.

It means that practically a half dozen men sitting in a room in Philadelphia or elsewhere can dictate the price of fuel to the millions, poor or rich, who must bow to their iniquitous monopoly. This small but select circle of tyrants and extortioners can absolutely raise the prices every year or every month 5 or 10 or 25 per cent., as their royal greed or pleasure may suggest. Their power is so unlimited that they sometimes complacently flatter themselves that they do not exact more.

Like Lord Clive, arraigned for his shameless rapacity in India, they declare that, in view of their opportunities, "they are astounded at their own moderation!" Whenever there is a strike for wages the "Anthracite Octopus" is absolutely serene. If the miners lose they are nothing out. If the miners win, the people are out—the consumer is always bled to furnish the blood which the Octopus sheds when a higher wage is granted.

If the miners win by a strike an extra wage of 2 or 5 per cent., the Octopus proceeds instanter to raise the price of the coal from 5 to 20 per cent.—and always the people pay the additional wage to the miner and a royal tribute to the Octopus for the trouble it has had in rearranging the scale. Three times the Anthracite Barons have done this, with an insolent, cold blood that has made the high cost an additional burden to the indignation and ignominy of those who are compelled to pay it.

How long is this shameful tyranny to go unchecked? How long, oh, Catalines of Coal, will there be this abuse of the people's patience? It needs neither socialist, nor anarchist, Progressive Democrat nor insurgent Republican to foresee and foretell the inevitable end. It is just as sure as logic that this progressive and independent people are going to rebel, and their representatives will be compelled to act.

It is certain that this program of the Octopus will lead—is leading now—to a government commission to regulate and control the monopoly in a great commodity of life. The commission is just as sure to come as the anthracite monopoly is sure to persist. And when it comes—this government commission—fresh from the hands of a plundered and indignant people—if its earlier decisions shall be somewhat radical and extreme, the Octopus will have no one to blame but the selfish conditions which created it and the insolent rapacity which provoked it to reform."

"Will the Public Stand for It?

As an outcome of the 5 per cent. increase which the anthracite operators were forced to grant the miners, the former have met together and decided to add 25c. per ton to domestic sizes of anthracite, which it is calculated will not only cover the increase, but add some $6,000,000 to the usual profits. That is to say, the "ultimate consumer" will not only provide the $6,000,000 which covers the wage increase, but another $6,000,000 also as a reward to the mine owners for paying the first $6,000,000 to the miners in increased wages.

And about the only editorial comment in the capitalist press on this proposition is summed up in the idiotic query, "Will the public stand it?" This query has been used with tiresome reiteration by the editorial hack writers of capitalist journalism ever since the trustified form of industry seemed to put the control of prices in the hands of trust magnates. Its irritating repetition is due to the fact that they have nothing else to say, and is in itself a pitiful, whining confession of weakness, impotence, ignorance and cowardice.

But "the public has stood for it" as patiently as they have the extortions of the coal barons and other trust robbers. Yet the capitalist editorial journalist seems to imagine that he has done his full duty to the subject and exhausted all its possibilities and aspects when he, according to the custom of his tribe, drools forth his feeble, plaintive query of "Will the public stand for it." That is their intellectual limit. Among them there has not appeared one man with sufficient brains, courage or imagination to describe what the "public" could or would do in case they decided "not to stand for it"; what attitude they would take, what manifestations they would make to demonstrate clearly and effectively that plaintive query of "Will the public stand for it?"

What could the "public" do to show that they "won't stand for it?" Boycott the product? That is clearly impossible, or, at least, is only possible in the sense that suicide is possible. Fuel is a necessity of life; in fact it is not too much to say that life cannot exist without it. And the "public," cowardly and stupid as it is, could hardly be expected to develop the "heroism" and idiocy necessary to die rather than pay the price asked. It has at least the will to live, so the boycott is not to be thought of.

Regulate the price of coal by law? The same "public" held up its hands in horror, even when trust magnates themselves suggested this method, and denounced the proposers as "Socialists." Forcibly seize the product in the coal yards, at the pit's mouth or in transit on the railroads, as some villages in the Middle West did in the winter of 1902 during the great strike of that year? That is plain highway robbery, confiscation, anarchism, and not to be thought of as a remedy, though it may happen sporadically here and there under stress of desperate necessity.

Has there ever been an instance of the "public" not "standing" for extortion of any kind? And if so, how have they proceeded in the matter? Let the editorial hacks of the press tell us. They cannot. For there will always be extortion as society is now constituted."

The Truth of the Matter

As a matter of cold fact, the raise in the price of anthracite in New York City is not unreasonable. The sizes which can be increased in price have been selected to bear the burden, and not those which face severe competition. The coal companies argue that the whole product must be sold to keep prices at a reasonable level; consequently, the price on each size must be such as grant it entrance to the market. Hence, with some exceptions, egg, stove, chestnut and pea have been advanced an even 25c. per ton, and the tabulation below exhibits the change in conditions.

INCREASED ANTHRACITE PRICES

Size	Tonnage sold, 1910	Per centage sold	Increase of price	Increased receipts
Lumps and steamboat	722,767	1.099	0.00	0.00
Broken	3,359,075	5.112	0.00	0.00
Egg	7,947,100	12.094	0.25	1,986,775.00
Stove	12,031,913	18.310	0.25	3,007,978.25
Chestnut	14,354,468	21.844	0.25	3,588,617.00
Pea	7,850,032	11.946	0.25	1,962,508.00
Buckwheat No. 1	9,464,528	14.403	0.00	0.00
Buckwheat No. 2 and rice	6,151,678	9.362	0.00	0.00
Buckwheat No. 3 and barley	3,399,451	5.173	0.00	0.00
Screenings	431,749	0.657	0.00	0.00
Total	65,712,761	100.000		$10,545,878.25

The gross increased return per ton will be 16.05c.

The increased cost of mining will hardly fail to reach 10c., should the regular office forces receive the same increase as the miners and laborers under the agreement. The net profit of the operator from the revision of the schedule of prices will therefore be about 6.05c. and to judge by his utterances he does not feel at all sure that such an increase will remunerate him for the increased depth and extension of the properties he is working, and for the greater cost of everything he buys. In fact he is barely on an equal basis with that on which he stood at the close of 1902. If rates of coal were then reasonable they will not be unreasonable today if the schedule adopted proves to be as indicated.

Examination of Coal by X-Rays

A paper, presented at the meeting of the North of England Institute of Mining and Mechanical Engineers, on June 1, by F. C. Garrett and R. C. Burton, gives an account of their examination of coal by X-rays. There are a number of operations where coal is washed at an excessive waste, the impurities being so completely part of the coal body that washing cannot be expected to produce the results desired. A rough washing will remove the grosser and more concentrated impurities, but cannot act on the disseminated foreign substances even if the greatest comminution is effected. A somewhat rough redraft of the paper mentioned is as follows:

Carbon Passes X-Rays

The ability exhibited by solids to resist the passage of X-rays is roughly proportional to the specific gravities of the bodies. Carbon and the organic compounds generally are much more transparent than inorganic materials, which make up the ash of coal. The diamond can be easily distinguished from its imitations by its transparency to X-rays. It is obvious, therefore, that if prints are taken from a radiograph of a piece of coal, the organic substance will hardly be visible, but the inorganic materials, associated with it, will be seen as dark or black spots and veins.

A piece of manjak, which is a form of asphalt, almost entirely free from ash, is nearly transparent and is but faintly outlined on a print. On the other hand, a cannel, which contains, as most of it does, a considerable percentage of inorganic matter, is opaque, and gives a remarkably bold, black print.

Mode of Operating in Making Prints

Typical pieces of coal were fixed in a metal holder and blocks cut from them by a fret-saw. A photographic plate was placed in a paper bag, the samples laid on top of the paper with the bedding of the coal at right angles to the plate and the whole was exposed to the rays for about 30 sec. After the plates had been developed and examined, the blocks themselves were broken up for examination and finally powdered for analysis. The radiographs were the same size as the pieces of coal used, but, of course, they showed objects reversed, the coal appearing light and the ash dark.

Generally speaking, the question whether the amount of ash left by a coal can be reduced by washing or blowing must depend upon the distribution of the ash. Where this is in distinct veins or patches, a moderate amount of crushing will serve to liberate it from the coal substance and permit it to be washed away, but if the ash is in a fine state of division and is mixed throughout the whole mass of coal, it is clear that it cannot be removed unless the whole of the coal be reduced to a very fine powder, when it would have little, if any, commercial value.

Distribution of Ash

A Durham gas coal, having calcite as an impurity, showed up as a faint gray with streaks of black. It contained 3.16 per cent. of ash, but this was so concentrated that, as the radiograph showed, it could easily be washed. Contrasted with it was the Rhas Las anthracite, which contained only 3.10 per cent. of ash. The body appeared transparent enough in the radiograph, but specks of black showed that it was everywhere filled with minute inorganic impurities, which were crystals of a mineral, probably Tridymite. This substance is colorless and transparent to ordinary light rays. It is a form of silica.

Two samples were taken of a coal yielding some 25 per cent. of ash. This coal was not greatly improved by washing and the radiograph showed the reason why. The prints looked like rough "rubbings," such as are made by antiquarians, to obtain reproductions of brass inscriptions. By running a soft pencil back and forth over a piece of paper, held against the inscription to be reproduced, its form is traced. The streaked appearance of back and forward rubbing is produced on the print, but here and there are more pronouncedly black spots, showing out conspicuously upon the somewhat streaky field. The impurity was evidently for most part in a very fine state of division and disseminated throughout the whole mass of the coal, though in places highly impure spots showed clearly on the print. Very few distinct particles of minerals were revealed, and the inorganic matter present was closely related to clay.

Radiographs will probably show whether coal with a high percentage of ash is suitable for washing, and, if so, the method will have a definite commercial value. Although true coal substance is almost transparent to X-rays, there are small, yet noticeable, differences between different coals, and even in different parts of a small specimen. Some coals, as one from the Little Hulton Seam, in County Durham, have small, well marked lines of stratification. This coal yields 6.35 per cent. of ash. On the other hand, the anthracite from Abercrave, South Wales, which yields 1.54 per cent. of ash, is almost structureless in its ash distribution.

Is Radiographic Structure Indicative of Coking Qualities?

Even more interesting were the samples of the Victoria Seam, County Durham. The ash in a specimen from that place only amounted to 1.24 per cent., but the coal showed a curious columnar structure and broke very easily into columnar fragments. The Victoria Seam yields a famous coke and it is interesting to note that such a structure as this can be detected in other coals which have been examined. The indications of columnization are, however, less marked in them than in the Victoria fuel. It is premature to declare that this structure is indicative of a coking coal, but the samples so far examined, though too few to justify any generalization, seem to suggest that this structure is characteristic of coals which coke.

Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. ROB'T MCKEAN, Sec'y.
505 Pearl Street, New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin, N. W. 7.

FLOYD W. PARSONS, Editor.

Correspondence suitable for the columns of COAL AGE solicited and paid for. Name and address of correspondents must be given—not necessarily for publication.

Subscription price $3 per year in advance for 52 numbers to any post office in the United States or possessions, and Mexico. $4 to Canada. $5 to any other foreign country.

Subscribers in Great Britain, Europe and the British Colonies in the Eastern Hemisphere may send their subscriptions to the London office. Price 21 shillings.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday of week prior to date of issue.

Entered as second-class matter, October 14, 1911, at the post office at New York, New York, under the act of March 3, 1879.

Cable Address, "Coage," N. Y.

CIRCULATION STATEMENT

Of this issue of Coal Age, we will print 7800 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal is interested solely in matters relating to the fuel industries, and is designed to be a medium for the free interchange of ideas, the detailed description of coal-mining practice, and the expression of independent thought calculated to benefit both operator and miner.

Contents

	Page
Foreword	1201
Fuel Economy of Colliery Boiler Plants.....M. A. Walker	1202
Bohemia as a Coal Producer.....	1205
Notes on the Impurities in Coal. F. R. Wadleigh	1206
Determination of Generator Capacity for Mine Haulage. E. B. Wagner	1209
Some Labor Saving Devices for Handling Mine Cars. Benedict Shubart	1210
Notes on Mining in India.....	1212
Boiler Feed Water.....	1213
Who's Who—In Coal Mining: Sketch of W. A. May.....	1214
Inability to Test for Gas. James Ashworth	1215
Kentucky Mining Institute.....	1216
Expropriation of Mines.....	1216
Gasolene Motors in Coal Mines. A. J. King	1217
Coal and Coke Patents.....	1218
An Unexpected Electrical Trouble at a Colliery.....	1218
Current Coal Literature:	
The Other Side of the Price Controversy	1219
Examination of Coal by X-Rays..	1220
Editorials:	
Every Man His Own Mine Foreman	1221
Western Coal Lands.....	1221
Nitroglycerin	1222
University Extension.....	1222
Discussion by Readers:	
Letters on Booster and Tandem Fans, by John Verner and John Sutton	1223
A Gravity Water System.....	1223
Compression of Air Before an Explosion	1224
Sociological Department:	
The Need for Thrift.....	1225
Examination Questions and Answers	1226
Coal and Coke News.....	1227
Coal Trade Reviews.....	1231

COAL AGE

Every Man His Own Mine Foreman

We cannot but approve the insistent demand that the mine foreman should ever watch, ward and forefend his men against the dangers of the mines due to bad roof. Seeing that we have so many men in our workings who are not judges of roof maintenance, that there are so many foreigners and new arrivals in the industry, we cannot eliminate or in any way abridge, but rather must increase supervision.

The men must remember that it is contrary to the American spirit of independence and selfhelpfulness that they should need so many nurses to watch them at their work and warn them of commonplace dangers; that care and that precaution are the duty of every man just as much as they are of the foreman.

It is to be regretted that it has been found necessary to provide so many men —bosses, assistant bosses, rib bosses, firebosses and timbermen—to protect the miner against danger when he could and should guard himself, if not nystagmic, deaf or blind. These safety supervisors are engaged, not in profitable creation, but in work which does not add in any way to the profit of the world.

Ultimately the consumer must pay, and as a consumer, the miner himself must pay for the safety provisions in his and other industries. The consumers, who are mostly the laboring men, can afford, well afford, to pay for all necessary means of securing safety, but they cannot afford to pay for the multiplication of unnecessary policing, and it is to be hoped that they will do all they can to police the industries themselves.

And, moreover, no provision of bosses will ever take the place of the miner's own constant watchfulness. Ardently should he embrace every opportunity to exchange recklessness and false courage for prudence and safe conduct. The work is his; it may be supplemented, but it cannot be wholly transferred. This appeal is made, not to ignorant workmen, but to a body of men acknowledged to be at least as efficient as those in the same industry in any country of the world.

Any man, who *is* a man, will seek his own safety and that of his fellows, and will scorn to demand the protecting ægis of others, when such protection is not needed.

Western Coal Lands

The conservation propaganda as regards the Western coal lands has now been in effect over a period sufficiently long to justify some demonstration of the many benefits which its authors claimed for it. A study of the situation at a number of typical and characteristic coal centers throughout the West fails to disclose many districts in which the law has not resulted in a direct and severe restriction to the development. The West is already burdened with many handicaps, such as long hauls over adverse mountain grades to remote and often uncertain markets, and any addition to present disadvantages is a distinct imposition on the industry.

As an example of the material results of the new rulings, we may take the cash coal entries made at the Evanston (Wyoming) Land Office during the last three years. This office covers all filings in Sweetwater and Uinta Counties, the largest producers in the state and one of the most important fields in the West.

During this period only six entries have been made, and on three of these the valuation by the government was placed at $180, $270 and $400 per acre respectively. On a fourth entry of 80 acres, one-half was valued at $49 per acre, the remainder at $92, and after the entryman built his own railroad and equipped a mine, the government has contested the claim.

One of the largest independent Western operators has offered a pertinent solution to the problem, which we believe should meet with the approval of even the most radical of the conservation enthusiasts. He suggests that the moneys

realized from the sale of the $400-per-acre Western lands be utilized for the purchase of other coal lands in West Virginia, Kentucky or Illinois—where the coal is liable to be of more value than in Wyoming. It is probable that in this way an average of one acre could be exchanged for four containing not only better-grade fuel, but more and thicker seams. This should satisfy those who believe that government control of the coal lands, would prove a good investment, and it would provide for conservation much closer to points liable to be short of fuel.

Again we urge the necessity of some consistent plan in regard to the Western coal lands, and voice an opinion against the present ill-advised policy.

Nitroglycerin

The value of scientific bulletins is not to be judged by their direct application to the conduct of daily life, and perhaps the recently issued monograph by Walter O. Snelling and C. G. Strom, on "The Behavior of Nitroglycerin When Heated" may meet with some criticism.

We trust, however, that the mining fraternity will appreciate all the solid unspectacular work done by the Bureau of Mines. Lord Kelvin always valued his determinations of constants as of equal value with his explorations in untrodden fields of science, and with those eminently practical inventions which made navigation safer and submarine telegraphy profitable. And this attitude is laudable because knowledge must be acquired before any advances can be made, though we cannot tell when the knowledge obtained will have its fruition in practical applications.

Of all the members of the Bureau of Mines, enthusiastic and devoted to their respective labors as they are, perhaps none is more enthusiastic and exuberant then Dr. Snelling. He has made several interesting investigations on explosives, and probably nothing but the inexorable right-of-way rule of the department of printing—"diatribes first, bulletins afterward"—has prevented more of his work from coming to hand long ago.

The bulletin shows that at some unstated temperature, nitroglycerin decomposes to such an extent that the action increases the heat of the explosive and ultimately converts it into a thick tarry, dark-brown mass. This temperature is less than 320 deg. F., but the experiments do not appear complete enough to show at just what point such exothermous action first begins.

Decomposition commences at 122 deg. to 140 deg. F. Is it safe to assume that if radiation, conduction and convection of heat were prevented at low temperatures, a marked exothermic action might take place with possible firing? We are sorry that this fact has not been determined. Pure nitroglycerin when heated may be safer than dynamite because the ordinary stick of the latter explosive, wrapped tightly in oiled paper and with each fragment surrounded by a nonconducting meal which also opposes convection, must be more favorably situated for retention of all heat derived from exothermous action. To this heat of decomposition may be probably ascribed most of the accidents arising from the thawing of dynamite.

Some time ago (Jan. 20) we recommended editorially that some attempt should be made to produce an explosive which would be absolutely fitted for mining work and to which we might apply the word "safe" without reservation or evasions. The work of Dr. Snelling will assist in that investigation, especially when he has extended it to the action of nitroglycerin mixtures with absorbents, stabilizers and cooling constituents. This is his announced purpose. It is to be hoped that it will bear fruit, but the investigation is to be approved whether successful or not. Moreover, it is his intention to find the explosion points of organic nitrates and of nitrosubstitution compounds.

University Extension

Even the staid old universities of Oxford and Cambridge have given extension schemes their countenance and support, and our more democratic institutions, notably the West Virginia and Kentucky Universities, are doing and should do no less for the unleisured classes. It is interesting to note that the University of Pittsburgh in its mining department is broadening out and giving short courses for practical miners who want to be firebosses, for the latter who desire to receive certificates as mine foremen, and for mine bosses who desire to enter the examinations for mine inspectorships. In addition, there is a course for mine electricians.

This is a move in the right direction, made by the right institution, for a better center than Pittsburgh for this purpose could not well be discovered. We have, however, a criticism to offer; the lectures on mine economics are reserved for those who are seeking positions as inspectors. The mine foreman has the greater need for a knowledge of that subject than has the inspector. True, he will get that training after he has obtained a job, and he will be proficient, perhaps, after he has been discharged three or four times.

But why not save him this expensive training and warn him early against the cry "cut the cost," and show him how money comes from judicious spending, so well distributed as to keep an even charge per ton? Why not teach him how to economize material and lives and at the same time succeed, not by bluster, but by firmness, making every action count. A little knowledge of system would make unnecessary much weary and profitless hustling, of which he has, under the law and the press of economic necessity, altogether too much in any event.

But we note one matter treated in the mine foreman's course. Lectures are to be given on: "Recovering coal mines after explosions and fires." This is a much needed study and one which has not been sufficiently considered hitherto. Words have often been coined to crystallize thoughts and make them permanent, and the selection of this subject for a course will serve likewise as a crystal center, around which will gather interest and knowledge of the action to take when explosions and mine fires occur. These disasters should be anticipated by every mine foreman, and the campaign against them planned as diligently as fields of battle are previsioned by a general during the piping times of peace.

We recognize the similarity of title to that of the book by W. E. Garforth, and it serves as a just tribute to a man whose life has been spent in reducing the risks of those who toil below ground.

In the history of mine explosions, more men in all probability have been killed by carbon monoxide than by direct concussion or flame inhalation. Hence the fatalities might have been considerably reduced by a provision of safety chambers.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Booster and Tandem Fans

Letter No. 9—I have read the first five letters relating to the discussion of Booster and Tandem Fans, COAL AGE, June 8, pp. 1150 and 1151. The uses and advantages of the booster fan are clearly stated in a few sentences in Letter No. 2, and the other four letters show that in actual practice such fans have proved of considerable value in aiding the proper distribution of air in cases where the general conditions affecting the ventilation of the mine were rather unfavorable.

But, while the booster fan has a legitimate place in mining, the necessity for its use should be avoided as much as possible; and I believe, with the writer of Letter No. 5, that, in most cases, the installation of such a fan is fair evidence that the general system of ventilation in the mine is inadequate and faulty.

While there is no disagreement among the writers of the letters as to the possible utility of the booster fan, there is a sharp contrast of opinion regarding the advantages accruing from the use of tandem fans. It is assumed and understood that, in the discussion of this feature of fan ventilation, the air volume entering and leaving the mine is considered without reference to the state of ventilation of the working places. The writer of Letter No. 1 shows that, in his opinion, the tandem arrangement of fans is absolutely without merit; and the writer of Letter No. 3 is positive that such an arrangement is beneficial. I am inclined to agree with the writer of the first letter, although it is possible that the writer of Letter No. 3 may be able to produce at least apparent proof to sustain his view in the matter.

Supposing, however, we have a flat seam of coal, opened by a drift and ventilated through an air shaft 250 ft. deep, 5000 ft. inbye from the drift mouth, the air shaft being the upcast for the mine. The circulation is produced by a force fan, operating at the drift opening. In this mine, in mid-summer, the volume of air passing through the mine is found inadequate and to increase the circulation an exhaust fan is placed at the top of the shaft to work in conjunction with the force fan at the drift mouth. The result is that a greater air volume is produced, and the writer of Letter No. 3 has apparently proved his case. But, suppose again that the fan at the drift opening be now removed, it would probably be discovered that the exhaust fan, working alone, would continue to produce the same volume of air as when the two fans were running together. The work of the force fan, operating by itself under the conditions named, was probably unsatisfactory, because it was working in opposition to the natural ventilation of the mine. The exhaust fan, on the other hand, assisted by the natural ventilation, could not fail to give better results.

The writer of Letter No. 3 says: "When the fan has reached its limit, if we place another fan on the same current either midway in the air course or at the outlet, it will have the same effect as if we cut the length of the airway in two." In other words, that writer seemingly believes that the tandem arrangement effects a marked decrease in the mine resistance, under the circumstances—a clear impossibility. The most that can be said in favor of fans running tandem is that the arrangement, though costly, may not prove otherwise harmful. It is impossible to install two fans to work concurrently on separate openings of the smae mine, so that they will produce exactly equal effects on the air; and it is evident that the fan that is the more efficient really carries the full load of the mine resistance and consequently makes the operation of the other fan useless.

While, in a theoretical way, it may be shown that the placing of two or more fans in connection with the same mine opening increases the air volume passing through the mine, still I agree with the writer of Letter No. 3 that the arrangement, when subjected to a practical test, will probably fail to give the expected results.

Chariton, Iowa. JOHN VERNER.

Letter No. 10—The use of a "booster" fan was the subject for discussion at the last meeting of the Indiana Mining Institute. The question was asked at the meeting whether the "booster" should be placed inbye or outbye of the overcast. My opinion in regard to this question is that whether ahead or behind the overcast does not matter much. But a "booster" fan should always be placed inbye of any leakage through stoppings or doors that may be in the mines. When the "booster" fan is pulling at one end of the air current and the main fan pushing at the other end, the "booster" has a tendency to draw the waste air that may be leaking through the doors and stoppings, and to a certain extent it will reduce this loss of air.

I must say, however, that I have no use for a "booster" fan, because I think it an unnecessary expense. I know of mines with a main haulage way 2½ miles long, where the ventilation is produced by a 24-ft. fan; and the air in those mines is equally good throughout the workings. My experience is that there is not sufficient attention paid to providing good air courses and keeping these clear of all loose slate that may fall from the roof, and other obstructions that prevent the free passage of the air current. In my opinion, the "booster" fan is of little or no service, except as I have explained, in reducing the leakage of air through doors and stoppings.

There are a number of mines opened on a small scale, and when the coal proves good new machinery is installed and the number of men doubled or more, and then it is discovered there is a lack of air. What is the cause? The airways are generally found to be too small for passing the quantity of air that is required. If that be the case, what good is a "booster" fan? My advice is when opening a mine, make the shaft of sufficient size and install a good fan, the larger the better, as any fan will stand slowing down better than it will an increase in its speed when more air is required. Also, drive the airways of sufficient size to carry the quantity of air that will be needed. As we know, the output of a mine chiefly depends on three things: 1. Good management; 2. Good ventilation; 3. Good roads. All other things will follow. JOHN SUTTON, SEC.,
Indiana Mining Inst.
West Terre Haute, Ind.

A Gravity Water System

While superintending the mines of the Canadian West Coal Co., at Taber, Alberta, which is located in the Belly River Coal formation, 30 miles East of Lethbridge, Alberta, on the Crows Nest Pass branch of the Canadian Pacific Railway, I originated and installed a novel, gravity-water system, which worked successfully and did not cost five dollars to install. These mines produced a high-grade lignite coal that was in great demand for domestic purposes. The mines are shallow, comparatively speaking, the thickness of the overlying strata being only 90 ft. They have never been known to generate gas and consequently the liability of accident from that source is very remote.

Upon taking charge of the mines I commenced to consider and size up the different systems of working the coal and methods in use, with the view of improving the same, if possible, in order to secure a maximum tonnage at a reduced cost, but not neglecting, at the same time, to consider the more important factor that should always be uppermost in the mind of every successful mine superintendent; namely, the safeguarding of the lives and health of the men employed in the mine and the protection of the property of the company. I found upon investigation that there was no system of fire protection installed; and as the mines were in general, very dry, and worked exclusively with open lights I considered there were grave chances of an accident from this source that might imperil the lives of the men and destroy a large amount of property.

The power house, which was equipped with boilers of 700-hp. capacity, as well as all the buildings of the company, including the houses of the miners, are supplied from the water works of the company, located on the banks of the Belly River, a distance of three miles from the plant. The water was pumped through a 10-in., wire-wound, stove-pipe, to a 90,000-gal. tank erected on a 52-ft. tower near the power house at the mine. This water system furnished an ample supply of water for all purposes, including an efficient system of fire protection for all buildings on the surface.

My plan of fire protection for the mine was as follows: Water barrels were placed at convenient points along the main and butt entries, which the foremen were instructed to keep full of water, at all times. These were each provided with two buckets hung on nails near the barrels, the water being supplied from the different sumps in the mine as often as necessary to replenish the barrels, using for this purpose the water car. The water in the barrels was to be used in fighting any fire that might be caught in its incipient stages when a bucket of water will often be more effective than a million gallons later.

Should a fire gain any headway, however, the master mechanic on the surface was to be notified, who would, immediately close down the compressors and use the 2½-in. fire hose to connect the hydrants located at the bottom of the water tank, 100 ft. from the power house, with the air receiver just outside the power house. At the same time the men in the mine were instructed to open all valves in the air line, except those near the fire, so as to drain off all the air contained in the pipe, as quickly as possible; and disconnect the line near the seat of the fire, and connect up the fire hose and nozzle kept for the purpose.

When this was done, at a given signal, the water from the hydrants would be turned on and run by gravity into the air receiver and down the slope through the air line into the mine. This would give an effective head of 150 ft., in the mine, to combat the fire. I should state that care is taken to again close the valves that were opened to allow the escape of the air from the pipe line; thus confining the whole force of water to the district in which the fire is located. The air line reaches all parts of the mine and supplies air to the coal-cutting machines used in undercutting the coal. The air lines on the main entries are 5 in. in diameter; those on the butt entries 3 in. and in the rooms 1¼ inches.

When the fire is out the water hose is disconnected in the mine and on the surface, the water allowed to drain off before the compressor is again started slowly at first so as to displace any water that might still be lying in the pipes. When the pipes are found to be clear of water, the valves are again closed and the compressor speeded up and the machines started in the mines as usual. This system should prove efficient wherever the conditions are favorable for its adoption.

JOHN W. POWELL,
Mine Superintendent.
Coalmont, B. C., Canada.

Compression of Air Before an Explosion

In Mr. Hall's article on "Stone Dust in Mine Explosions," published in COAL AGE of Nov. 25, 1911, you speak of the dust's advance toward the disturbance or, in other words, of the dust being carried to and injected into the flame of the explosion. I agree with you that this "advance" exists in every explosion and I will add, that in my judgment, the "rate of advance" should be considered the most influential factor in determining the explosion's violence and extent. I am well aware that this view has found no favor so far with the "experts," but this is no proof that it is not correct. I have good reason for saying that the view will be vindicated and accepted in the near future and that the proof of its correctness will be so plain and convincing as to put an end to all further controversy on that point.

This proof must consist of unmistakable and visible facts. I should appreciate your coöperation in this direction and if in your investigations of explosions you have discovered any facts showing the existence of the "advance," will you kindly advise me regarding them through the columns of COAL AGE?

JOHN VERNER.

Chariton, Iowa.

[The nature of my views on the advance at an explosion are better explained in my letter to the *Engineering and Mining Journal* of Jan. 21, 1911, than in my article in COAL AGE of Nov. 25, 1911, because the article was in extension of the preceding remarks and referred to the effects of the advance rather than to the advance itself.

I did not have reference to any insucking action such as you believe to exist, though such may possibly occur. The advance to which I refer is that of the regular ventilating current. An explosion fronts an advancing current of air on one side and hustles a retreating current on the other. It is true that when an explosion is underway, such a confronting may not be important, but at starting there are obviously great possibilities of compression when a moving body of air is suddenly stopped. Nor as my article shows are those possibilities limited to compression. They are sure to be aided or restrained by the greater advance of the contained dusts.

COMPRESSION RESULTING FROM A SUDDEN ARREST OF VENTILATION

We know what a soughing of the wind results from the sudden closing of a mine door. The reversal or diversion of the current exhibits the dynamic energy of the air with startling effects. Doors close but slowly in the mines, whereas an explosion suddenly erects a barrier across a gallery and the pressures created must be temporarily immense, despite the loss from friction and the heat losses of compression. Theoretically $ft = mv$; the product of the time of stoppage (t) and the force created (f) equals the mass of moving air (m) multiplied by its velocity (v). An air current, a mile long, weighs about ten tons, and so it is easy to see that if the velocity is great and the time is a small part of a second, f would be almost infinitely large if air were not compressible.

The advance cannot be proved by any direct evidence, and, in fact, it must be true, proved or unproved, from the condition of the hypothesis. But whether the theory based on the advance is tenable or not is a question of the degree to which the advance modifies the direction of an explosion. That is another story. Some light could be thrown on it by suddenly dropping a diaphragm across a moving current of air. But even then not all the dust nor even the greater part of it would necessarily strike the diaphragm. The essential point in the dust aggregation theory is that the dust in a cubic foot of air advances further than the air in which it is suspended when the diaphragm stops the current. It may not travel far. All will not reach the diaphragm. But the fact remains that when the dust outtravels the air in which it is suspended, it must aggregate *toward* the diaphragm if not at it.—R. D. HALL.]

Sociological Department

For the Betterment of Living Conditions in Mining Communities

The Need for Thrift

By Charles L. Fay*

In discussing the question of conservation we too often overlook a practical phase of the subject, i.e., the conservation of personal resources. The waste from lack of wise domestic economy and thrift is a serious hindrance to the social advancement of many wage earners and it would be well if thrift societies were established wherever miners live. Great advantage would be derived from conferences of the men and women of mining villages if they would meet to discuss "domestic economy and thrift." Meetings of the institute or convention type should be held with specialists present to lead discussions on subjects such as "What and How to Buy," "How to Get One Hundred Cents Value from Every Dollar," "Economical Preparation of Food," "False and True Ideals in Living," "Buying on the Installment Plan," "How Children May be Well-dressed for the Least Money," "The Liquor Evil," etc.

This article is not a criticism but rather a suggestion. We are apt to give our attention so directly to what we think others should do for us that we forget to consider what we may and should do for ourselves. Too many of us are our own worst enemies.

Struggle for a Livelihood Despite Good Wages

I recall the case of a miner and his wife who, in season and out of season, were given to berating society, their employers and neighbors and to bemoaning their own condition. They gave little or no thought to household economy or to any faults of their own in connection with their straightened circumstances. The man earned on an average $75 to $90 per month and paid $8 a month rent. His family consisted of himself, his wife and seven children. The only call made on that family toward maintaining local institutions was from the church and they rarely, if ever, gave to that nor did they contribute anything toward the support of the aged and infirm. The wife did as well as her lights permitted her. She worked early and late, for we never hear of an eight-hour day for the miner's wife. She was often too sick to work; but she had to keep going, for there was Annie and Maggie and Katie and Willie and James and Henry and the baby to look after. And the husband—he merits help rather than condemnation. Nothing has entered his life to direct its course aright and his mind lacks discipline and the balance of self-control and constructive thinking. Of course he may think he knows and he may tell you: "To—with your nonsense about thrift and domestic economy." More's the pity!

Low Wages and Comfort

I recall the case of another miner and his family which contrasts so strongly as to warrant notice. He earned $45 to $75 per month and paid $8 a month house rent. He has been in the employ of the same coal company for 30 years. During the first few years of service he held minor laboring positions. He and his wife have six children living, but both were children of poor but thrifty parents. They lived within their means, were thrifty and had a practical knowledge of household economy. Their children were well dressed and reared under the beneficent influences of a home where good books, noble character and high ideals, without extravagant luxuries, promoted true culture and refinement.

This husband and wife share home responsibilities—they are makers of the best type of community life. The husband spends no money for "booze." They help to maintain their church and aid in the support of an aged parent. One son, with some aid from home and by his own industry, was able to attend college. Today he is a physician. Two of the daughters graduated from a state normal school and are successful teachers.

The description of the home life of the first family portrays the condition in hundreds of homes in the coal-mining communities. The second family indicated supplies a picture of an unusual type of miner's home, particularly as it relates to the segregated districts.

The first mentioned man and his wife were married about fifteen years ago and have been in debt ever since the first baby was born. Always "paying on account" on old bills, usually in need, constantly crying out against the evils of society and the hardships imposed upon them because of the wrongs of others, yet blind to their own lack of thrift.

This man is of the type which quickly responds to the call of the anarchistic socialist leader—responds but does not comprehend the real basis of that to which he does respond. He "feels" something is wrong but the wrong is all outside his own class. He reasons the same way in personal matters. He knows something is awry but the "wrong" must be with society. He fails to recognize that he is a part of society and that he is, first of all, his own problem.

Neither he nor his wife know how to get the most for their money. They are imposed upon by unfair or careless merchants. In the purchase and use of food stuffs they are as improvident as when buying or making their clothes. They often say "All we get out of this world is what we eat and we will have all we want of that," and seemingly with that thought uppermost they proceed to set up a false standard of both quantity and quality.

Small Earners Often Profligate Spenders

The daughter of a miner employed in the home of a family where the yearly income was from $3000 to $3500 a year would often remark, "You folks don't buy nearly as many things to eat as we do at home." It was true. The family employing her, however, lived well and always had substantial food and plenty of it. There is a science in eating as well as economy in right buying and careful preparation of food.

But to return to the family we first considered: The husband left the responsibility of "running the house" entirely to the wife. On pay day he would deliver his "envelope"—then, having performed that duty, would immediately get back as much for spending money as he might persuade her to give, and leave the "Missus" to pay bills as best she could. The spending money mainly went for "booze."

To show the causes leading to the two results would be possible but tedious and the problem is so manifest and the remedy so apparent that qualification here seems necessary.

Would it not be "good business" for those who have the welfare of mining communities and the mining industry at heart to give definite attention to these matters wih a view to developing adequate plans to deal with the needs and conditions? True, something is being done here and there by mining companies and various associations. In some instances surveys are being made by experts who report to proper bodies; but these efforts are as yet but the confirmation of the need for united, comprehensive and adequate treatment.

*Mining secretary, State Y. M. C. A. of Pennsylvania, Wilkes-Barre, Penn.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Examination Questions

(Answered by request)

Diffusion of Gases

Ques.—Explain the law of diffusion of gases and its effect on their behavior in mines. Give rule and example showing how to find the comparative velocity of diffusion of the different gases.

Ans.—When two or more gases of different densities are in contact their molecules intermingle according to the law of diffusion. The law of diffusion, otherwise known as Graham's law, and a full explanation of the same will be found in Coal Age, Dec. 16, p. 319.

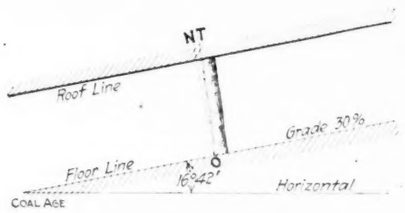
The effect of diffusion on the behavior of gases in mines is to cause them to assume a different position, in the entry or in the workings, from the position they would assume if unmixed with other gases lighter or heavier than the gas in question. For example, the specific gravity of carbon dioxide is 1.529, that of marsh gas 0.559; the former gas being nearly three times as heavy as the latter. When these gases have diffused into each other without mixing with air, the gaseous mixture has a specific gravity of 0.925. Being lighter than air the mixture tends to accumulate at the roof or in rise workings. This mixture has often puzzled firebosses, who fail, generally, to detect the cap that appears for a moment and quickly vanishes. The light is dimmed and often extinguished by this gas, which is found at the roof. Not seeing the cap the fireboss concludes it is not marsh gas; and, the gas being found at the roof, he reasons it cannot be carbon dioxide or blackdamp.

Timbering a Slope in a Steep Pitching Seam

Ques.—Describe the proper method of timbering a slope; the grade is 30 per cent., and the slope is to be timbered with 8 in. x 9 in. timber, in such manner as to give a clearance of 8 ft. in width and 7 ft. in height. Give the angle at which the posts should be set.

Ans.—The method of timbering, in detail, can only be determined when the character of the roof, floor and coal is known. Where the strata are hard and firm, little timbering will be required. With a softer roof, crossbar timbering will be required; and where the roof is frail the timber frames must be set close together; in some cases what is termed "skin to skin" timbering must be used. With a soft floor, it may be necesary to use mud sills, either crosswise, or longitudinal sills on each side of the roadway, to prevent the posts sinking into the floor. In general, when timbering a slope of considerable inclination, the posts must be "underset," that is to say, inclined up the pitch the amount depending upon the inclination of the slope. The purpose of this is to overcome the trouble arising from the tendency of the roof to slip downhill, as the work of extraction proceeds.

Referring to the accompanying figure, showing the profile of an inclined slope



Showing Manner of Undersetting Post Timber on Steep Pitches

or heading, the line $N O$ is a normal line perpendicular to the roof and floor lines of the seam. When a post is *underset* the head of the post leans up the pitch a slight angle from the normal, the amount to be determined by the character and inclination of the strata. In the present case, the grade being 30 per cent., the tangent of the grade angle is 0.30; and the grade angle is 16° 42′. For this angle of inclination, the angle at which the post should be inclined from the normal or the underset angle $N O T$ will vary from one to three degrees, according to the conditions that determine the slipping of the roof. When this is done any movement of the roof downward tends to tighten the post; whereas, if the post were not underset, it would fall out when the roof slipped downward.

In order to give the desired clearance when using 8 in. x 9 in. timber, it will be necessary to drive the entry 8 ft. x 10 ft., in cross-section. The collars or crossbars and the legs are set so that the 9-in. dimension will oppose the weight of the roof and the thrust of the sides. The collars should be cut 9 ft. 6 in. long and measure 8 ft. between notches. The legs should be 7 ft. long and should incline inward or toward the center of the road, from 6 to 8 in. The joints of the posts and collars should be cut to an even bearing.

Danger Point In Mine Air

Ques.—How many cubic feet of marsh gas will be required to be generated in a mine each minute to render dangerous a current of 30,000 cu.ft. of air per minute?

Ans.—The percentage of gas required to render the air of a mine dangerous will depend, in each case, on the character of the coal and the condition of the air with respect to dust. A soft inflammable coal, under conditions otherwise favorable, may be rendered dangerous by less than 1 per cent. of marsh gas in the mine air; while a hard coal (anthracite) can hardly be considered to produce dangerous conditions under less than, say 2.5 per cent. of gas. When the air in such a mine contains more than 2.5 per cent. of gas, something should generally be done to improve the condition.

Assuming, in the present case, that the mine air approaches the danger point when it contains 1 per cent. of gas, the volume of gas required to be generated in the mine each minute, to produce this condition would be

$$\frac{30,000}{0.99} - 30,000 = 303\ cu.ft.$$

The total volume of air and gas in the return current would then be 30,303 cu.ft. per min., 1 per cent. of this or 303 cu.ft. being gas.

When a Lamp Flames

Ques.—If, when testing for gas, your lamp fills with flame but does not explode, what would you do to protect yourself?

Ans.—Keep my head; make no quick move; withdraw the lamp cautiously but promptly from the gas. The fact that the lamp has not exploded shows the gas is not "sharp," and as long as the gauze is fairly cool there is no danger of igniting the gas outside of the lamp, provided the lamp is drawn away slowly. In withdrawing the lamp the movement should be downward, as far as possible, in order to avoid the danger of the air pressure due to the movement of the lamp forcing the flame through the gauze and igniting the gas outside.

Set the lamp carefully on the floor and if the flaming continues, cover it very cautiously with a coat or other garment, so as to exclude the air and smother the flame. This must be done with great care and the lamp must be kept upright; there would be danger in turning the lamp on its side to wrap it in a coat.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

Director Holmes, of the Bureau of Mines, has filed with the House of Representatives a statement apropos of the pending Bureau of Mines appropriations. In this he gives an account of the work that is being done and is contemplated by the bureau. Mr. Holmes says that in 1912 full training in mine-rescue work was given to 1300 miners and partial training was given to over 3600 miners. Training in first-aid work was given to over 7000 men. During 1913, it is planned to give full training in mine-rescue work to about 6400 miners, and first-aid training and partial mine-rescue training to a much larger number.

In connection with this training, the cost of materials used in the work during one week will average not less than $5 per miner, and in some cases as much as $10, this cost varying with the express or freight charges involved. The plan of maintaining mine-rescue cars has called for a much larger expenditure than would have been necessary if the work of the bureau had been conducted from some headquarters like that in Pittsburgh, but this scheme of having the cars, with complete equipment on them, go from one mining camp to another, has been found to be not only the most successful method of giving training to the miners, but also the easiest and cheapest way of making the necessary examinations of the mines themselves. It is with a view to meeting the additional expenditures necessary to carry out fully and successfully the plans for mine-rescue cars and stations, as well as for mine-safety investigations, that the increase shown in the present estimate has been asked for.

Work of Testing Coals

In regard to the work of testing coals, Mr. Holmes states that whereas when the bureau was first organized, it was called upon to actually supervise for the government the purchase of less than 1,000,000 tons of coal a year, for 1913 the amount of coal to be purchased under the bureau's supervision will be more than 2,000,000 tons, requiring the collection and examination of more than 14,000 samples. Mr. Holmes makes a part of the record a letter from the Panama R.R. Co., which states that the company estimates that in one season about $30,000 was saved by it, as the direct result of having its coal purchases tested by the bureau, before shipment, and then deducting proportionate amounts from the price, in case the coal fell below a certain standard.

The Government in the Coal Business

In reporting the Panama Canal Bill, the Senate Committee on Interoceanic Canals has made some interesting alterations in the provisions of the House bill, relating to the power of the government to establish depots for the sale of coal and other supplies to vessels passing through the canal. Section VI of the revised bill contains the following provision:

> The president is also authorized to establish, maintain and operate through the Panama R.R. Co., or otherwise, drydocks, repair shops, yards, docks, wharves, warehouses, storehouses and other necessary facilities and appurtenances for the purpose of providing coal and other materials, labor, repairs and supplies for vessels of the Government of the United States, and incidentally for supplying such at reasonable prices to passing vessels, in accordance with appropriations hereby authorized to be made from time to time by Congress as a part of the maintenance and operation of the said canal.

The new provisions affecting the character of ships that may be permitted to pass through the canal are also proving of great interest to shippers of coal. The chief change in this connection is found in Section XI and, as now formulated by the Senate Committee, this reads in part as follows:

> No ship owned, chartered, operated, or controlled by a railroad company, or in which any railroad company has any interest whatsoever (by stock ownership or otherwise, either directly or indirectly, through any holding company, or by stockholders or directors in common, or in any other manner), shall be permitted to enter or pass through the Panama Canal if engaged in the coastwise trade between ports of the United States.

Alabama

Birmingham—According to all indications, the production of coal in Alabama for the first half of the present year ending on June 30 will break all previous records. It is estimated that the output of the mines will exceed 8,500,000 tons and may reach 9,000,000 tons.

Glenn Wood Traer, of Chicago, one of the best known coal men of the Illinois field, was in Birmingham recently after having been engaged in looking over the coal properties in Tuscaloosa and adjoining counties which W. H. Skaggs, of Chicago, is developing. Mr. Traer, it is understood, has a considerable interest in the property and expressed himself as confident that extensive developments would be made.

Arkansas

Russellville—Preparations are being made to re-open the Humphrey-Smith coal mines north of this place. This property was formerly worked on a large scale, but was never very profitable because of its location two miles from a railroad. The mine lies on the line of the proposed Russelville, Dover & Northern R.R., and taps a seam of high-grade lignite coal. It will be worked extensively in the event of the proposed road becoming a reality.

Colorado

Denver—A company is being formed to construct 40 miles of railroad from Steamboat Springs to Craig, Colo. This line will tap the rich coal and agricultural district in the vicinity of Craig. The project is being promoted by a group of capitalists which is separate from the interests of the Moffat road but it is believed that this new railroad will some day become a part of the larger company. A committee of the bond holders of the Denver Railroad Securities Co., which controls the stock of the Denver, Northwestern & Pacific Ry., the Moffat road, now in the hands of receivers, recently proposed to raise $1,000,000 to expend on betterments.

Illinois

Bloomington—The mine of the McLean Coal Co., which has been sealed during the past six weeks following a destructive fire, was opened June 10, and a preliminary inspection of the conditions in the pit was made. Because of the presence of blackdamp the exploring party was unable to reach the seat of the fire, which is supposed to be about one-half mile distant from the foot of the shaft. The inspectors are of the opinion, however, that the fire is entirely out..

Catlin—The Shirkey mine at Bennett Station, on the Rossville-Sidell branch of the Chicago & Eastern Illinois R.R., west of this city, was closed down recently for an indefinite period. It has been rumored for a long time that the mine was not a paying investment, but this is the first evidence that has come to verify the rumor. The Shirkeys, who have been operating the mine for the past two years,

have spent a great deal of money putting it in working order.

DuQuoin—The Queen City mine, one of the largest in this vicinity, resumed operations recently, as did also two other large collieries and it is expected that within another month all the mines in the vicinity will be working. Work was started recently on sinking new shafts for the Zeigler Coal Co., north of Christopher, on the Burlington R.R. The new mine is to have a daily capacity of 4500 tons, and will be one of the largest operations in southern Illinois.

A tract of 160 acres of coal land, just south of here, was recently optioned to a concern of Danville, Ill., which expects to prospect the property in the near future, and if indications are favorable will remove the coal, which lies at a depth of about 15 ft., by stripping off the cover with a steam shovel.

Litchfield—Hoisting coal was begun recently at the No. 1 mine of the Illinois Midland Coal Co. at Kincaid, a new operation. It is expected that the mine will work steadily all summer and eventually a force of several hundred men will be employed.

Peoria—It has been announced by President Winchell, of the Frisco, that arrangements for the construction of a new line into Peoria will proceed at once. This will be an extension of the Eastern Illinois R.R. from St. Elmo via Springfield, Mo., to Peoria, about 130 miles, and will be an important factor in the Illinois coal traffic. Work on the extension of the New Orleans, Mobile and Chicago line is progressing satisfactorily.

Indiana

Brazil—Several mines in the Block coal field were badly damaged by caveins during the suspension from Apr. 1 to June 1. The Zeller-McClelland mine No. 5 may not reopen, according to the officials, who say that these workings suffered so greatly that only after great labor and expense can they be made ready for operation. The block coal operators, in general, say that there is a fair accumulation of orders waiting to be filled and that there will be plenty of work as soon as the mines are ready for operation.

Sullivan—The Shirley Hill Coal Co., which has just completed the installation of a large coal washer at its mine No. 3, east of Sullivan, made a test run recently. The washer and equipment are said to have cost about $100,000. This is the first mine in Indiana to install a plant of the kind.

The Paxton Coal Co. recently filed articles of incorporation. The company is to have a capital stock of $100,000, and its headquarters will be located at Sullivan.

Coal Bluff—The 95 mine workers employed by the Ehrman Coal Mining Co. have demanded a weekly pay. The men sought legal advice and were told that the law compels a company to pay an employee weekly if the employee demands it, but that the demand is a matter of discretion. The contract between the Indiana Bituminous Operators' Association and the mine workers provides for a pay every two weeks, but the Ehrman Coal Co., it is understood, is not a member of the operators' association.

Boonville—While some of the outside Warrick mines are working, the Big Four mine here is idle. One reason assigned for this is the failure of the coal company to reach terms with the Southern R.R. for its coal contract under the new scale.

Iowa

Boone—A new coal company, called the Deep Vein Coöperative Coal Co., has just been formed. Its headquarters will be in Fraser. The company is composed of 20 Fraser citizens who have a tract of 320 acres of the famous lower-vein coal. It is their intention to sink a shaft and start mining as soon as possible.

Des Moines—Some of the local railroads report a pronounced shortage of cars. With the reopening of the mines, the demand for coal has become great. Some coal is moving, but there are not cars enough to take care of the orders at the mines.

Kentucky

Mt. Vernon—The Kentucky Portland Cement & Coal Co., recently incorporated, has taken over its property consisting of 2000 acres of coal and cement land near Pine Hill, Ky. The property is already improved to some extent, these improvements consisting of a private railroad line, a coal tipple, miners' houses, etc. Work on opening the mines has been undertaken and the railroad, which was in rather bad shape, is being rebuilt. Orders have been placed for new power-plant and mining-machine equipment and it is expected that the installation of this will be completed within 30 days. The company believes that it will be shipping coal within three months.

Madisonville—L. S. Jackman, of Henderson, Ky., has announced that he has disposed of 95,000 acres of coal land in McLean County, acting as agent for a large number of landowners in that district. Eastern capitalists, whose names have not been given, were the purchasers. An option on the property was taken last November and the titles are now being cleared by a survey. The headquarters of the syndicate, which it is said has been active in purchasing western Kentucky coal lands, are in Cleveland, Ohio.

Drakesboro—A petition in involuntary bankruptcy was filed recently against the Elk Valley Coal Co., alleging that the liabilities of the company are in excess of $100,000. It is said that an execution was levied on the property in May and that this constituted an act of bankruptcy. Mules, cars and machinery were sold at that time to satisfy a judgment.

Michigan

Flint—The Burton Coal Mining Co. has disposed of its coal leases to the Whatcheer Mining Co., of Bay City. The Burton company has prospected over a considerable section of territory southeast of this city. It is understood that the Whatcheer Mining Co. will begin operations at once. The vein on the property is said to be from 3½ to 4 ft. thick.

Montana

Helena—Suit was instituted by the government here recently against three individuals and the Lockfay Coal Co., to recover title to 160 acres of land in the Great Falls land district. Fraud is alleged. A temporary injunction to restrain the coal company from mining, pending the final determination of the suit was asked for. It is charged that all the parties concerned knew that the land was more valuable for mining than for agricultural purposes and that each transfer was made in full knowledge of the fraud that had been practiced.

Ohio

Pomeroy—After several weeks of negotiation, the wage scale between miners and operators of the Pomeroy Bend district was signed June 12. Practically all the large operators of the field met with the miners in this agreement. The miners asked for a number of concessions not covered by the Cleveland agreement, but these were finally waived and the agreement was ratified. Work in all the mines of this district is now going on rapidly.

Toledo—The United States district court at Toledo recently handed down a decision fining the Hocking Valley R.R. Co. $42,000, and the Sunday Creek Coal Co., $20,000, for violating the Hepburn law relative to rebating. Both the railway company and the coal company will appeal from the decision, which they claim is without precedent. It was charged that two years ago the railway company accepted from the coal company notes instead of cash in payment for transportation. The effect of this action, the government maintains, was to give interest on unlimited credit, which really meant rebates.

Bridgeport—Operators and miners of the north end of sub-district No. 5, United Mine Workers, met at New Philadelphia, on June 10, to establish a wage scale under the Cleveland agreement. Five thousand miners are affected.

Coshocton—The joint conference between miners and operators failed, on June 8, to reach an agreement under the

Cleveland compromise. It was thought that the disagreement might result in a strike in the Coshocton field.

Columbus—The Ohio coal mines are operating at about half capacity and are producing much less than their normal output for this season of the year. It is stated that practically the entire output of the state is coming from the No. 8 seam in the Cambridge and Hocking fields.

Pennsylvania

BITUMINOUS

Kittanning—The Allegheny River Mining Co., operating large collieries at Conifer, in Jefferson County, and at Seminole and Chickasaw, in Armstrong County, is now engaged in the development of plants at Hunt's Run, in Jefferson County, and at Furnace Run, on the Allegheny River, in Armstrong County. The new plants will give the Allegheny River Mining Co. a daily capacity of 10,000 tons. The mines are located adjacent to the Pittsburgh & Shawmut R.R., which is extending its line from the mouth of Mahoning Creek south along the Allegheny River to Freeport, where the mining company owns 35,000 acres of coal land, containing both the Freeport and Kittanning seams.

Johnstown—A deal has been closed by which the Shade Hill Coal Co. secures about 3000 acres of valuable coal and timber lands in Shade Township, Somerset County, at a purchase price that is estimated to be in the neighborhood of $100 an acre, or $300,000 in all. The purchase gives rise to the rumor that the company is acting in the interest of the Western Maryland R.R., which, following the completion of the connecting link between Cumberland and Connellsville, is seeking an entrance into the coal fields of this section. Other property has been optioned and it is believed that at some future time the entire tract will be turned over to the New York Central interests, of which the Western Maryland company is a subsidiary.

Of the 15,000 miners in Cambria County, it is estimated that only one-half are working, and these are working only two or three days a week. On the other hand, the Berwind-White Coal Mining Co. and the United Coal Co., in Somerset County, are seeking men.

Alleging that the scales were defective, about 100 employees of the Pennsylvania Coal & Coke Corporation, at Beaverdale, went on strike recently. Both mines Nos. 1 and 2 of the Pennsylvania company, at Benscreek, have been closed down and a large number of miners are idle.

Connellsville—The owners of the Fort Palmer Coke Works, in Ligonier Valley, have sold their interests to a company of Pittsburgh men, known as the Westmoreland-Connellsville Coal & Coke Co., who contemplate developing the property on an extensive scale. Three hundred and fifty acres of coal land, together with a fully equipped coke plant, of 80 ovens, electric haulage, etc., are included in the sale.

Orders of the Interstate Commerce Commission, dismissing proceedings instituted by the Anaconda Copper Mining Co. and others to secure a reduction of the rate on coke from West Virginia and Pennsylvania ovens to Chicago were sustained recently by a decision of the Commerce Court.

Butler—The Vageley Coal Co. of this city has opened a new mine two miles east of here on the Pennsylvania R.R. The mine is completely equipped with new machinery and a number of new miners' houses have just been finished.

ANTHRACITE

Scranton—The fourteenth annual district convention of District No. 1, United Mine Workers, opened in Scranton, July 15. This convention will discuss plans for reorganizing and strengthening the union, and officers will be elected for the ensuing year. There is manifest considerable opposition to the reëlection of Adam Ryscavage, as vice-president.

Wilkes-Barre—The Anthracite Miners' Conciliation Board met here, June 10, for reorganization. This is the first meeting of the board in a number of weeks. The personnel of the new board is the same as it has been heretofore, the operators being represented by W. L. Connell, W. J. Richards and S. D. Warriner, and the miners by John P. Dempsey, Thomas Kennedy and Thomas Fahy.

Trustees of the proprietors of Kingston Township won a verdict of $101,864 against the Lehigh Valley Coal Co., on June 13, after a trial which had lasted two weeks. A number of years ago, a tract of coal land was given to the property owners of the township with the understanding that the income should be used for school purposes. The Lehigh Valley Co., it was alleged, has been mining coal under this tract without payment of royalty and the jury sustained the township's claim for damages.

Preparations have been made in both New York and Philadelphia for conducting investigations regarding the recent increases in the price of anthracite coal. The New York Retail Dealers' Association has addressed a letter to the heads of the several anthracite-carrying railroads, and in most cases has received a reply to the effect that the companies would coöperate with the association in their investigation, to the extent of furnishing certain information to the association's traffic manager. Governor Tener, of Pennsylvania, was requested to conduct an investigation, but pointed out that he is without authority to summon witnesses, and the Pennsylvania State Railroad Commission likewise concluded that such an investigation is outside of its province.

Pottsville—It is understood that Mechanicsville is to become a mining town again, if plans to operate the old Salem Hill workings are carried out, as expected. It is understood that Dolan Brothers, contractors, have secured leases from the Philadelphia & Reading company and from the Sheaffer estate, and will operate the mine.

West Virginia

Charleston—The sheriff of Kanawha County announced, June 10, that he had in hand the situation among the miners in the Paint Creek section, where riots have occurred between miners and guards during the past several weeks.

The Kanawha River Coal Co. has been incorporated here, to operate mines near Witchers, in Kanawha County, W. Va. The company has an authorized capital stock of $250,000, of which $200,000 has been subscribed and paid. F. P. Key, of Charleston, is one of the trustees.

Wheeling—Considerable excitement has been created in this vicinity and in eastern Ohio because of reports to the effect that the Pennsylvania R.R. contemplates tapping coal fields in West Virginia and in the vicinity of Hannibal, Ohio. The reports, while lacking official confirmation, are given credence by the landowners of the section. Specifically, it is stated, that the Pennsylvania will extend its Powhatan branch from Powhatan down the river shore to Hannibal. The Hannibal coal field, if developed, would be afforded an outlet to the Lakes by way of Wellsville and the Yellow Creek branch to Cleveland.

Wyoming

Rock Springs—It is reported that the Wyoming Coal Co. has completed arrangements whereby it will open a large mine on an entire section of land about two miles from here, toward Reliance. It is the intention of the company to develop the property as quickly as possible, and it is estimated that employment will be given to several hundred men.

Canada

Toronto—The Dominion Coal Co., on June 12, broke all previous records by raising 17,647 tons of coal at its various collieries.

The Canadian Coal & Coke Co. is now operating a number of Western coal-mining properties under one management. The constituent companies are: The Lethbridge Colliery, Ltd.; the St. Albert Colliery, Ltd.; the Pacific Pass Coal Fields, Ltd.; the Western Coal & Coke Co., and the Kootenay & Alberta Ry. Co. The authorized capital of the Canadian Coal & Coke Co. is $15,000,000, and the authorized bond issue, $6,506,600.

Personals

D. C. Boag, a graduate of Pennsylvania State College School of Mines, has been appointed assistant to general manager J. C. Rawn, of the Solvay Collieries Co., Marytown, W. Va.

Jere H. Wheelwright, president of the Consolidation Coal Co., will leave shortly for an inspection trip over the properties of the Consolidation company in Kentucky and elsewhere.

E. C. Roberts, Jr., has been appointed superintendent of the mines of the Fairmont Coal Co., in the Allegheny Valley, to succeed J. A. Beam, who resigned recently to look after private business.

G. B. McCormick has been elected president of the Alabama Coal Operators' Association. C. F. DeBardeleben was elected vice-president, and James L. Davidson was made secretary-treasurer.

William Leckie, of Welsh, W. Va., has been chosen president of several companies in the Pocahontas region, to succeed the late W. A. Lathrop. Mr. Leckie is now president of the Lathrop Coal Co., the West Virginia Pocahontas Coal Sales Co., and the West Virginia Pocahontas Coal Company.

Robert H. Gross, of Boston, Mass., has been elected president of the New River Coal Co., to succeed Samuel Dixon, resigned. Henry M. Sweet was elected vice-president and Frank C. Dowst, secretary and assistant treasurer. Mr. Gross left immediately after his election to spend a week or ten days on the property in West Virginia.

Morris Knowles, sanitary engineer of Pittsburgh, Penn., who has been engaged in examining for the Alabama Coal Operators' Association the social and sanitary conditions of mining camps in this field, will discontinue his work and return to Pittsburgh on July 1, as it is thought all has been done in this respect that can be done for the present.

Frederick M. Chase has been elected vice-president and general manager of the Lehigh Valley Coal Co., to succeed S. D. Warriner, who resigned to become president of the Lehigh Coal & Navigation Co. Mr. Chase, who is now general superintendent, has been with the Lehigh Valley company for 30 years, holding the record for the longest continuous service of any officer of the company.

Thomas Graham, chief inspector of mines for British Columbia, left Victoria, on June 12, for Columbus, Ohio, to attend the fourth annual convention of the Institute of Mine Inspectors. Mr. Graham was for several years general superintendent for the Western Fuel Co., with collieries at Nanaimo, Vancouver Island, B. C. He will visit the United States Bureau of Mines' testing station, at Pittsburgh, and afterward, some of the representative coal mines in Illinois.

Chronology of Coal Mining for May

May 1—Wage-scale agreement reached in Kanawha field of West Virginia.

May 2—Representatives of anthracite miners refused to accept agreement reached by subcommittee of miners and operators, Apr. 25.

May 6-11—Serious rioting in various parts of the anthracite field.

May 7—Illinois miners voted to accept wage scale and return to work. Contract signed May 17.

May 11—Miners of western Kentucky voted to return to work, pending arbitration of slight differences over wage scale.

May 15—Wage-scale agreement signed for Hocking district of Ohio.

May 18—Convention of anthracite miners voted to accept agreement of Apr. 25. Contract signed, May 20. General resumption of work, May 22.

May 29—Iowa miners voted to accept proposed agreement and return to work.

May 30—Wage-scale contract signed for Missouri, Kansas, Oklahoma and Arkansas.

May 31—Wage-scale contract signed for bituminous field of Indiana—After prolonged strike, miners attacked guards in Paint Creek region of West Virginia.

Trade Catalogs

Hyatt Roller Bearing Co., Newark, N. J. "Something about Hyatt Roller Bearings." 52 pp., 9x12 in., illus. A handsome and profusely illustrated description of Hyatt roller bearings and the plant at which they are made.

Standard Wood Pipe Co., Williamsport, Penn. "Blue Book" on machine-made wood-stave water pipe. Descriptive catalog of pipe and fittings; prices; engineering data. 30 pp., 5¼x9 in., illus.

The Ohio Brass Co., Mansfield, Ohio. Catalog No. 12. Electric Railway and Mine Haulage Specialties. 485 pp., 6½x9½ in., illus. A valuable and attractive catalog, of electrical specialties, overhead material, rail bonds and car equipment.

Industrial Notes

The Winnipeg branch of the H. W. Johns-Manville Co., owing to its rapidly increasing business, has found it necessary to move into new quarters at 92 Arthur St., Winnipeg. By reason of this move, a much larger and more complete stock of goods will be carried on hand than heretofore, and a larger force will be employed to look after the company's interests.

The Pennsylvania Storage Battery Co. has just been reorganized under the name of the Hirsch Electric Mine Lamp Co., of Philadelphia, and the following officers have been elected: H. H. Hirsch, president; Baird Snyder, Jr., formerly general superintendent of the Lehigh Coal & Navigation Co., vice-president; Percy C. Madeira, of the Madeira, Hill Co., Philadelphia, treasurer, and F. B. Thorne, of Thorne, Neal & Co., secretary. The new company will engage in the manufacture of portable electric lamps for miners and mine use.

Construction News

Marianna, Penn.—The Pittsburgh-Buffalo Co. has started the construction of 500 additional coke ovens at its Marianna plant.

Dover, Ky.—J. J. McMillan, Dover, is planning the construction of a coal elevator and tramway to convey the coal from barges to storage.

Forsyth, Mont.—The Great Northern Ry. will construct coal pockets at Forsyth to cost $70,000. A. H. Hogeland, St. Paul, Minn., is chief engineer.

Hamdem, Ohio—The Vinton-Jackson Coal & Mining Co. is preparing for an extensive development of coal properties in Vinton County, eight miles east of Hamdem.

Fraser, Iowa—The Deep Vein Coöperative Coal Co., Fraser, recently incorporated, has acquired about 350 acres of land and is planning to sink a shaft. Frank Walters is president.

Harriman, Tenn.—The H. B. Bowling Coal Co. was recently sold to H. Bowling and others. The new owners will spend approximately $25,000 in repairing and improving the property at Coalfield, Tenn., on the Harriman & Northeastern R.R.

Ottawa, Ont.—The Transcontinental Ry. is receiving bids for a number of 200-ton mechanical coaling plants with sand houses and track approaches and a 1000-ton coaling station with inclined trestle approach. P. E. Ryan, Ottawa, is secretary.

Kittaning, Penn.—The Alleghany River Mining Co. is engaged in developing properties at Hunt's Run and Furnace Run on the Alleghany River. The Furnace Run property will be equipped with an alternating-current central power plant to supply power to other fields, north and south of Furnace Run, upon which development is expected to take place at an early date.

Boston, Mass.—The Metropolitan Coal Co. has prepared plans for the immediate development of 10 acres of waterfront property on the north side of the Chelsea bridge. A large cement elevator and coal pocket will be built, and the company will make adequate provisions for the storage and rehandling of fully 1,000,000 tons of coal per year. In addition, the company will provide pier accommodations, 300 ft. long with 30 ft. of water at low tide.

Connellsville, Penn.—The Westmoreland-Connellsville Coal & Coke Co., a recently organized concern of Pittsburgh, has purchased the property of the Fort Palmer Coal & Coke Co. in the Ligonier Valley, consisting of 350 acres of coal land, 80 coke ovens and other improvements. The new owners contemplate developing the property on a large scale, increasing the number of ovens to 200, building miners' houses, and making other improvements on the property.

Pittsburgh, Penn.—The Reliance Coke Co., of Pittsburgh, has been incorporated with H. B. Fownes, president, W. C. Fownes, vice-president and W. C. Fownes, Jr., secretary and treasurer. We are officially informed that this company will immediately start development of 600 acres of coking coal land at Denbeau Station on the P. V. & C. Division of the Pennsylvania R.R. near Brownsville. Two hundred and fifty rectangular coke ovens will be built and a modern plant will be made ready for operation by about the first of the year.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The coal market has settled down to the customary summer dullness, the buying for general purposes being light and new business uniformly scarce. The trade is not, however, abnormally low for this period of the year, and on the whole exhibits a strong, healthy tone.

In anthracite there is a decided lack of activity, and while considerable is being shipped, there is no great anxiety on the part of consumers to purchase. Rumors of price cutting are beginning to appear, particularly in egg, on which some concessions are being offered. Stove is in good demand, and the steam sizes are now being stocked.

There is little or no change in the Eastern soft-coal situation. The market still drags, and while some higher prices are being quoted on coastwise coal, this additional profit is being absorbed by the vessels. Conditions may be helped some by the improvement in steel, but new business generally is scarce and operators are obliged to content themselves with deliveries on contract. In the Pittsburgh district, some mines are working up to full capacity, while others have not opened up since the suspension; the movement in the Lake trade from this point is not as large as was expected.

In Ohio, the principal feature of the trade is the Lake business. The prices at the docks are low, but the movement is so heavy that the deficiency is being made up in this way. The domestic trade is dull and quiet, but there is some evidence of activity in steam. In Virginia there has been another quiet week, with a light dumping at Hampton Roads.

The situation in the Middle West is showing some slight improvement, although trade generally is listless. The Indiana mines are now producing at full capacity, and there is a heavy movement from this field. The dull market at Chicago has resulted in a cut in prices, but the possibility of a car shortage later in the season is tending to strengthen quotations. A few small contracts are being closed up, at irregular prices. Quotations generally are weak, almost down to cost of production, and will probably remain so for the next two months.

Boston, Mass.

The Eastern market is practically unchanged from a week ago. Some new contract business is rumored but almost no information is given out as to details. The opinion is that prices on season business are a little higher than last year, but of this advance, more is due to increased water freights than to any better net return on coal at the mine. Vessel owners find that in many cases they would have lost less money in 1911 by putting tonnage out of commission than by running at the low rates that obtained. So this year they have fixed upon a freight rate that so far has been rigidly maintained.

All the distributors of Pocahontas and New River are long on supplies and short on orders. These grades have been freely offered within a week at $2.50 f.o.b. Hampton Roads, and it would not be surprising if still lower quotations are now offered. The abundant supply of water for mills all over New England is not helping to strengthen the market; in fact, there is nothing favorable in the price situation at the present time.

Anthracite shipments are still slow. Some of the companies have so far shipped no coal at all to this market, which is rather remarkable after nearly a full month of mining. Stove coal in all grades is hard to get, and dealers here are beginning to show anxiety over the small receipts thus far. The all-rail hard-coal movement is slightly better than by water, although none too good for the depleted yards all over the territory.

Current wholesale prices on bituminous are about as follows:

Clearfields, f.o.b. mine	$1.10 @$1.30
Clearfields, f.o.b Philadelphia	2.35 @ 2.55
Georges Creek, f.o.b. mine	1.52 @ 1.62
Georges Creek, f.o.b. Philadelphia	2.77 @ 2.87
Pocahontas, New River, f.o.b. Hampton Roads	2.50 @ 2.70
Pocahontas, New River, on cars Providence	3.35 @ 3.50
Pocahontas, New River, on cars, Boston	3.35 @ 3.60

New York

Anthracite—The anthracite trade is still fairly active, but there is a marked falling off as compared with the sharp demand immediately following the end of the suspension in mining. Prices are being well maintained at the new circular, although there are rumors of some cutting in egg. Production is now up to about 85 per cent. of capacity, and there are some accumulations of the steam grades noticeable. The stove size is in the best demand, but, generally speaking, consumers are not taking coal as freely as the producers would like to see. However, the buying may be stimulated during the remainder of the month, because of the fact that 10c. per ton will be added to the price of prepared sizes on July 1. Production of anthracite to the first of the current month was 9,188,000 tons behind last year, and indications are that the production for June will be comparatively light.

The following are the wholesale f.o.b. quotations, those for the Lackawanna and Wyoming being at the upper ports and the Lehigh and Schuylkill for the lower:

	L.&W.	L.&S.
Broken	$4.70	$4.65
Egg and stove	4.95	4.90
Chestnut	5.20	5.15
Pea	3.50	3.45
Buckwheat	2.75	2.45
Rice	2.25	1.95
Barley	1.75	1.70

Bituminous—The New York bituminous trade is down to the customary low point at this season of the year. Few spot sales are being recorded, and the movement is confined almost entirely to contracts. The better-grade coals are holding firm, although there are some rumors of cutting; the low grades are down to about the cost of production in some instances, and are hard to move at any price. Vessel rates are lower, with plenty offering in any size the shipper may require.

We continue to quote prevailing wholesale prices as follows, although there is some shading from these:

West Virginia, steam	$2.35
Ordinary grades, Pennsylvania	2.45
Fair grades, Pennsylvania	2.55@2.65
Good grades, Pennsylvania	2.70@2.80
Best Miller, Pennsylvania	3.00
Georges Creek	3.15

Pittsburgh, Penn.

Bituminous—The coal market still drags, buying for general purposes being light, while the movement in the Lake trade has not reached the expected proportions. On the whole, the Lake movement is not materially better than it was a year ago, although this season was expected to produce a much larger total. There are the same predictions that the second half of the Lake season will prove better than the first, a prediction which was not verified last year.

While stocks in manufacturers' hands are being worked off, the local demand has not brightened to the extent expected. A few of the mines have not yet resumed since the mining suspension, while some of those operating are running at full capacity. The Pittsburgh Coal Co.'s mines, however, are doing very well. Prices are quite irregular, special quotations being made on nearly all orders of any moment. The regular season prices, which are frequently cut, are: Mine-run and

nut, $1.22½; ¾-in., $1.32½; 1¼-in., $1.47½; slack, 82½c. Slack is being cut rather deeply.

Connellsville Coke—Owing to the observance, by many merchant operators, of a "stop-day" last Wednesday, the prompt coke market has stiffened, and been quotable at not far from $2.25 in the past few days, when sales had previously been made down to $2 or possibly a shade lower. The situation is not strengthened sufficiently to enable the operators to secure their $2.50 price for second-half contracts, and the deadlock still continues.

In a few cases operators have accepted materially less than this figure, but the bulk of the contracting remains to be done. The current production having proved more than adequate for requirements of the tributary blast furnaces, the only hope of a high price for second half seems to be a material increase in the number of furnaces operating. Repeated reports have circulated that a number of additional furnaces were about to blow in, but the expectations thus far have not been borne out. We quote: Prompt furnace, $2.20@2.25; contract furnace (largely nominal), $2.35@2.50; prompt foundry, $2.35@2.50; contract foundry, $2.40@2.75.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended June 8, at 398,656 tons, an increase of 20,000 tons, and shipments at 4283 cars to Pittsburgh, 6166 cars to points west and 1318 cars to points east, a total of 11,767 cars, an increase of 406 cars.

Philadelphia, Penn.

There has been no marked improvement in the anthracite trade in this vicinity during the past week; as a matter of fact, there is a decided lack of activity. By this it is not meant that there is no coal moving as considerable is being shipped, but there seems to be no particular anxiety on the part of the consumer to take on supplies during the initial month of low prices. This in a great measure is due to the fact that many householders have left the city or had made their preparations to go before the resumption of mining, and the reduction of 30c. in the circular has not proved sufficient inducement to get them to take on coal now.

It is understood that the large operators are well supplied with orders, sufficient to carry them well on into July, but the individual cutting of prices is commencing to appear and as the summer grows older, these operators will not hesitate to quote figures away below the so called established prices. Already the egg size is being offered at a concession from the circular.

Conditions in the mining regions have not improved to such an extent yet as to warrant the statement that production is up to normal. Some of the mines report that their output compares favorably with a year ago, but the men are coming back slowly, and it will probably be the first of July before production will have reached the usual level. Stove seems to be the size most in demand, and it is understood that there are sufficient orders already placed to absorb the production of this size for the month. Steam sizes are going into stock, and there will be more than a market for them during the coming fall and winter.

The bituminous market is at a standstill. Demand is light, prices low, and no improvement apparently yet in sight.

Baltimore, Md.

New business has been scarce during the past week and local operators have had to content themselves with deliveries made under existing contracts. One or two of the larger companies report a few more inquiries from industrial plants which are increasing their output, and these may develop into actual business shortly. There has also been some improvement in steel which will benefit the companies here.

Shipments through Baltimore were rather heavy during the week, and the showing for the month will be good. At one of the railroad piers, it was reported about the middle of the week that over 25,000 tons of coal had moved through Baltimore up to June 10, and that it was expected to handle about 60,000 more by the end of the month. At other piers, the tonnage for the month will be even larger.

The coal trade here is vitally interested in the announcement that the new Connellsville extension of the Western Maryland Ry. will be placed in operation on the first of August. The completion of this line means that the Western Maryland will have the shortest route to Pittsburgh, and that in the future they will be in a position to compete more successfully for business in the Pittsburgh and contiguous districts. Local operators also believe that the new direct line to Baltimore from Pittsburgh, Connellsville and other points, will mean an increase in the movement of coal through this port.

Buffalo, N. Y.

The consumption of bituminous continues liberal and the prices would be strong but for the over-production, which is still so great that there is no chance of any sort of control on the part of the producer.

It is now predicted that no stir will take place in bituminous till after the middle of September, and it is problematical as to the trend of the market then. The over-solicitation of coal orders may so fill up the storage room of consumers that they will still be indifferent to the market and refuse to pay anything more than the present cost prices.

That there is a good consumption by manufacturers is shown by the report that gondola cars are growing scarce in Pittsburgh. They are needed in the steel trade and the roads always protest against using them for coal when there are steel shipments requiring them. It is, therefore, merely a matter of too much coal, and till that can be remedied, the prices will remain weak and low.

The May prices given out at Pittsburgh for coal from that district, for sale in Buffalo, are continued at $2.57½ for three-quarter, $2.47½ for mine-run and $2.10 for slack, all prices being weak and unsteady. Coke is a trifle stronger, on account of the light production. Quotations are based on $4.50 for best Connellsville foundry. There is very little coal on track unsold, as at present prices it takes little car service to wipe out all profit.

Cleveland, Ohio

There has been some little improvement in the steam trade in the past week, due to the fact that some of the consumers are getting to the end of their supply, purchased before the suspension. Prices, however, have not improved. There has been considerable slack on the market, and much difficulty in disposing of same. Prices for No. 8 slack are as low as $1.50, and Pittsburgh about the same.

The Lake trade is also dull as the railroads are not bringing the coal in fast enough, and consequently boats are delayed. Plenty of coal is being mined, but it is stated the railroads lack equipment and are very slow in bringing the coal forward.

Columbus, Ohio

The feature of the coal market in Ohio during the past week was the increase in the Lake trade which is now the principal business. The Hocking Valley and eastern Ohio districts are shipping considerable tonnage via the Lakes to the Northwest and preparations are being made to increase this still further within the next few weeks. Some of the smaller operators in the Hocking Valley and other mining districts will soon start shipping and it is believed that the year 1912 will be one of the largest in Lake business in Ohio for years.

Prices on the docks are somewhat low but the larger tonnage will more than make up the deficiency. Chartering of boats is going on actively and the fact that the ore trade remains good is aiding in making the movement larger than under ordinary conditions. The tonnage loaded by the Hocking Valley Docks at Toledo for the week ending June 14 was 117,000 tons as compared with 120,000 tons for the previous week. The total loaded up to June 14 was 689,000 tons.

Not all of the activity is seen in the Lake business as there is also some stir in domestic circles. The stocking-up season has not yet arrived but there is

some advertising for school coal and a number of these contracts have been awarded. There is also considerable demand for the fancy grades of domestic.

The steam business is fair although this branch of the trade has shown little improvement over the previous week. Some of the large railroad contracts which were expected to be awarded last week are still hanging fire and this has the effect of holding the trade up to a certain extent.

Prices prevailing in Ohio are:

Hocking Valley	
Domestic lump	$1.50
¾-in	1.35
Nut	1.15
Mine-run	1.15
Nut, pea and slack	0.65
Coarse slack	0.55
Pittsburgh No. 8	
¾-in	1.10
Mine-run	1.00
Coarse slack	0.70
Pomeroy Bend	
Domestic lump	$1.50
¾-in	1.35
Nut	1.20
Mine-run	1.15
Nut, pea and slack	0.75
Coarse slack	0.50
Kanawha	
Domestic lump	1.50
¾-in	1.30
Mine-run	1.10
Nut, pea and slack	0.65
Coarse slack	0.55

Hampton Roads, Va.

Hampton Roads has again passed through a comparatively quiet week, so far as the coal situation is concerned. As a result of the light dumping since the first of the month, the majority of shippers have a large accumulation on hand. Indications, however, point to heavier dumping during the last 15 days than the first, several substantial charters being reported.

In addition to the commercial orders, a number of Navy colliers are also due within the next two weeks. On June 30, the Navy fuel contract expires and the new one with Hampton Roads producers becomes effective. The new contract proves considerably more attractive than the old one, as it carries with it a price 20c. a ton higher than last year.

There has been a slight weakening in prices during the past week. While no low price sales could be confirmed, there are rumors that some spot coal was sold at less than $2.70, which has been the price paid since the British strike was adjusted.

New England vessel rates now appear at their lowest. South American rates have stiffened somewhat, due to the fact that little cargo freight is now moving out of the principal South American ports giving coal steamers a return cargo.

Birmingham, Ala.

In spite of the warmer weather the coal market here holds firm. The belief now is that the ginning season will be reached without a material break in quotations. Some important annual contracts have been closed during the past few days in the Birmingham market at what is considered a very fair price. Conditions along and beyond the Mississippi River have cleared up and this has been followed by business from that quarter.

The steam demand in general is much above that which prevailed at this season of the year in 1911, all lines of consumers being in the market stronger. The railroads in particular are drawing constantly heavier tonnages.

It is now reported that there is a possibility of two new iron furnaces going into blast about the middle of the year, contingent, of course, upon the condition of the iron market. The prevailing opinion in the iron market here is that there will be a better price for iron by the beginning of the last half. If this turns out correct the coal market will be helped.

Nashville, Tenn.

There is no change in the situation in this field; the month of June is usually the dullest of the season and this year brings no exception. If there is any difference, it is probably a little more quiet owing to the fact that the storage coal, which was put in by certain interests, is just about being used up.

Domestic trade does not open here before the latter part of July and everything is very dull. No one seems to be making any special effort to obtain business now, but there is quite a lot of interest shown in the prospective trade for the coming fall and winter.

Quite a number of Memphis and Nashville coal dealers and operators attended the annual convention of the Kokoals in Cincinnati, and reports from same were that the meeting was a great success, and one of the largest ever held by this order.

Prices of coal in the West Kentucky field may be listed as follows:

Lump	$1.10@1.15
Nut	1.10@1.15
Mine-run	0.80@0.85
1¼-in. screenings	0.40@0.50

Indianapolis, Ind.

All the Indiana mines are now working, with the exception of those damaged by the long suspension, and two or three where small strikes have occurred over trivial matters. The output has been satisfactory and readily moved by the railroads.

The operators say they are gradually filling the bulk of the accumulated orders, and the distribution is such as to supply all the industries depending on Indiana coal. The demand for coal by automobile manufacturers is perhaps the most steady and slightly on the increase. Public-utilities companies are likewise arranging for future coal supplies.

It is freely predicted that stripping coal with steam shovels will soon materially increase the output in this state. This work can, and is being done, by inexperienced men, and they are producing considerable coal. Preparations for stripping are under way at a number of places, which will soon be producing coal.

Chicago

There has been a reduction of from 10 to 15c. a ton in the Chicago market on some varieties of coal as a result of a listless trade. This cut is particularly noticeable on screenings which have dropped from $1 and $1.10 f.o.b. mines to 90 and 95 cents.

There also has been a slight drop in the price of mine-run. Dealers who anticipate a shortage of cars later in the season have been buying domestic to some extent. The anthracite trade is dull. Prices for furnace and foundry coke remain firm. The new contract prices for the latter are close to $2.50 a ton f.o.b. oven.

Prevailing prices at Chicago are:

Sullivan County	
4-in. lump	$2.47
Egg	2.37
Mine run	1.99½
Screenings	1.87@1.97
Springfield	
Domestic lump	$2.32
Steam lump	1.97
Mine-run	1.82
Screenings	1.67@1.72
Clinton	
Domestic lump	$2.27
Steam lump	2.12
Mine-run	1.92
Screenings	1.77@1.82
Pocahontas and New River	
Mine-run	$3.15
Lump and egg	3.55

Coke—Prices asked for coke are: Connellsville, $4.85@4.90; byproduct, egg and stove, $4.65; Wise County, $4.75; byproduct, nut, $4.55; gas-house, $4.65.

Minneapolis—St. Paul

There is just a slight change for the better in the Northwest trade. That is to say, some ordering of domestic coal has been done, showing a tendency to be forehanded. Certainly the retailer gains in every way to place his orders now for stocking coals. Prices as yet are on a summer basis, but that they will be much firmer within two months, is believed by all wholesalers.

But a small amount of anthracite has been received at the upper Lake docks thus far, and at best there will be a short season for docking anthracite. In fact, the demand East is such, that with the limited output since resumption of mining, there is not much anxiety on the part of the operators to rush shipments to the West. Anthracite requirements in the trade west of Buffalo is not to exceed 12 per cent. of the total output.

A great variety of soft-coals are making a strong bid for a share of the tonnage in the Northwest. Of course, Hocking and Splint coals for domestic purposes are still in great demand. For many years Hocking alone held the lead. Then Pocahontas steadily won its way and later the Splint coals.

St. Louis, Mo.

There is nothing doing in the St. Louis market, and the demand is about what it has been for the past two or three weeks. There are a few small contracts being closed up at very irregular prices, and in nearly every instance, practically at the cost of production. There are a few inquiries coming in from the country, and indications are that business will continue to improve slightly from this time on.

The prevailing prices are:

Franklin County	
6-in. lump	$1.35@1.50
3x6 egg	1.35@1.50
Nut	1.35@1.50
No. 2 nut	1.25@1.35
Screenings	0.90@1.00
Carterville	
6-in. lump and 3x6 egg	$1.20@1.35
Nut	1.15@1.25
Screenings	0.90@1.00
Washed No. 1	1.30@1.50
Washed No. 2	1.30@1.40
Washed No. 3	1.25@1.35
Washed No. 4	1.15@1.20
Washed No. 5	0.90@1.00
Mine-run	1.05@1.10
Mount Olive	
Lump	$1.15@1.25
Nut	1.00@1.10
Screenings	0.90@0.95
Standard	
2-in. lump	$0.85@0.95
6-in. lump	0.90@1.00
Screenings	0.85@0.90
Mine-run	0.85@0.90
Anthracite, f.o.b. St. Louis:	
Grate	$6.65
Egg and stove	6.90
Chestnut	7.15
Pea	5.90

San Francisco, Calif.

Arrivals by sea for the month of May include 13,403 tons of Pocahontas for the government, 10,800 tons of Wellington and 10,861 tons of Australia. The quantity of coal now afloat from Australia and due to arrive within the next 60 days is very small, approximately 4500 tons. In addition to this tonnage there are vessels listed of a carrying capacity of 25,000 tons, due some time between August and December.

There is practically no change in the coal situation; demand for household purposes continues to be very light in this city and vicinity. The little wanted in the interior is chiefly taken care of by the Rocky Mountain product.

Current rates to dealers are as follows:

Wellington (British Columbia)	$8.00
Pelan Main (Australia)	8.50
Rocky Mountain	8.50
Cumberland	12.50

Portland, Ore.

The weather is ideal for summer, and coal is not in great demand. However, it is expected that storage prices will be quoted soon and there should be considerable advance business for next winter.

The building of railroads into the Coos Bay country will probably be followed by active development of the coal fields there, some announcements to this effect having already been made.

Production and Transportation Statistics

Lake Traffic

The following is a comparative statement of the coal tonnage through Sault Ste. Marie canals, season to June 1, short tons:

	1911	1912
Anthracite	266,822	17,848
Bituminous	1,792,324	1,653,022
Total	2,059,146	1,670,870

Southwestern Tonnage

The Southwestern Interstate Coal Operators' Association has issued the following comparative statement of tonnage for February:

State	1911	1912	Increase
Missouri	180,871	305,759	124,888
Kansas	349,450	501,121	151,671
Arkansas	81,585	176,210	94,625
Oklahoma	170,747	267,731	96,984
Totals	782,653	1,250,821	468,168

Norfolk & Western Ry.

The following is a statement of the commercial and company coal from mines on the N. & W. Ry., for the month of May, in short tons:

From	Commercial	Company
Pocahontas	1,194,629	104,154
Tug River	166,334	41,215
Thacker	176,369	54,281
Kenova	75,518	8,935
Clinch Valley	124,995	9,065
Total	1,737,845	217,650

The Car Situation

The surplus of idle cars on the railways of this country and Canada, which increased rapidly with the continuance of the anthracite strike, is again approaching the normal number. The fortnightly bulletin of the American Railway Association reports a net surplus of 86,386 on June 6, the smallest number since the report for Apr. 11.

Practically all of the decrease is accounted for by the better demand for coal cars with the resumption of mining operations. There was a slight increase in the number of box and flat cars idle, but the number of unused coal cars decreased more than 33,000.

Chesapeake & Ohio Ry.

The following is a statement of the coal and coke traffic over the lines of the C. & O. Ry. for March and April, and the ten months ending Apr. 30, 1912, in short tons:

Destination	March	April	10 Months
Tidewater	487,236	533,226	3,625,675
East	198,472	189,712	1,860,988
West	805,017	875,602	9,137,493
Total	1,490,725	1,598,540	14,624,156
Coke	22,932	19,992	190,540
From Connections			
Bituminous	20,060	10,514	184,464
Anthracite	3,330	3,215	33,191

Foreign Markets

Great Britain

The coal market is, if anything, just a little better. Best Admiralty steams appear to be well stemmed, on paper, for June, and the value is about $4.32, although some sellers ask a little more. Quotations are as follows:

Best Welsh steam coal	$4.32
Seconds	4.02
Thirds	3.84
Best dry coals	4.26
Best Monmouthshire	3.72
Seconds	3.60
Best Cardiff small coal	2.48
Seconds	2.34

The prices for Cardiff coals are f.o.b. Cardiff, Penarth, or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days, less 2½ per cent.

German Empire

The production, imports and exports of the German Empire for the month of April, 1912, were in metric tons:

	Production	Imports	Exports
Coal	14,061,701	215,867	2,947,025
Lignite	6,356,025	558,583	5,022
Coke	2,318,777	39,673	391,762
Briquettes	2,013,812	14,243	201,998

Financial Notes

The Delaware & Hudson Co.—There was paid into the sinking fund of this company, under the first and refunding mortgage, $277,040, being 1% of the bonds outstanding May 1, 1911; total paid to the first of this year, $619,470, expended in additions and betterments.

Nova Scotia Steel & Coal Co., Ltd.—This company last year paid dividends at the rate of 8% on the preferred and 6% on the common shares, quarterly; the regular quarterly dividends of 2% on the preferred and the 1½% on the common has been declared for the first quarter of the current year.

Pittsburgh Coal Co.—The bonded debt of this company, Dec. 31, 1911, consisted of $10,084,000 5% first mortgage bonds and $5,926,120 5% debenture bonds, a total of $16,000,000. The interest on these is $800,000 a year, which, together with the interest on the proposed bond issue, would bring up the annual fixed charges to $2,925,000.

Four States Coal Co.—During the nine months' operation ending Mar. 31, 1912, this company paid interest on their bonds, 6% on preferred stock, and have added $40,604 to surplus accounts. During the month of March earnings, after making due provision for sinking fund and interest charges, were on a basis of 20.7% per annum on the preferred stock.

Reading Co.—For the nine months to March, a balance of $7,988,456, after railroad renewals, has been piled up. Disregarding the renewal expenditures, amount of which cannot be known in advance, this balance is equal to 8.4% on the stock compared with 5% in the same period of 1911. Counting in renewals, earnings for the year of 1911, equal 12.1%. With an advantage of 3.4% to the end of nine months, it does not seem unreasonable to expect 14% for the current year.

Dominion Coal Co., Ltd.—This company exchanged $3,500,000 6% cumulative income bonds for a like amount of preference shares of the Dominion Steel Corporation, Ltd. Proceeds of the sale of these shares will be utilized for the equipment of collieries Nos. 12 and 14, the completion of Nos. 15 and 16, and construction of No. 17, two new collieries in the Morien district and of one at Springhill; also the extension and further equipment of the Sidney & Louisburg Ry., new shipping piers, new washing plants, etc.